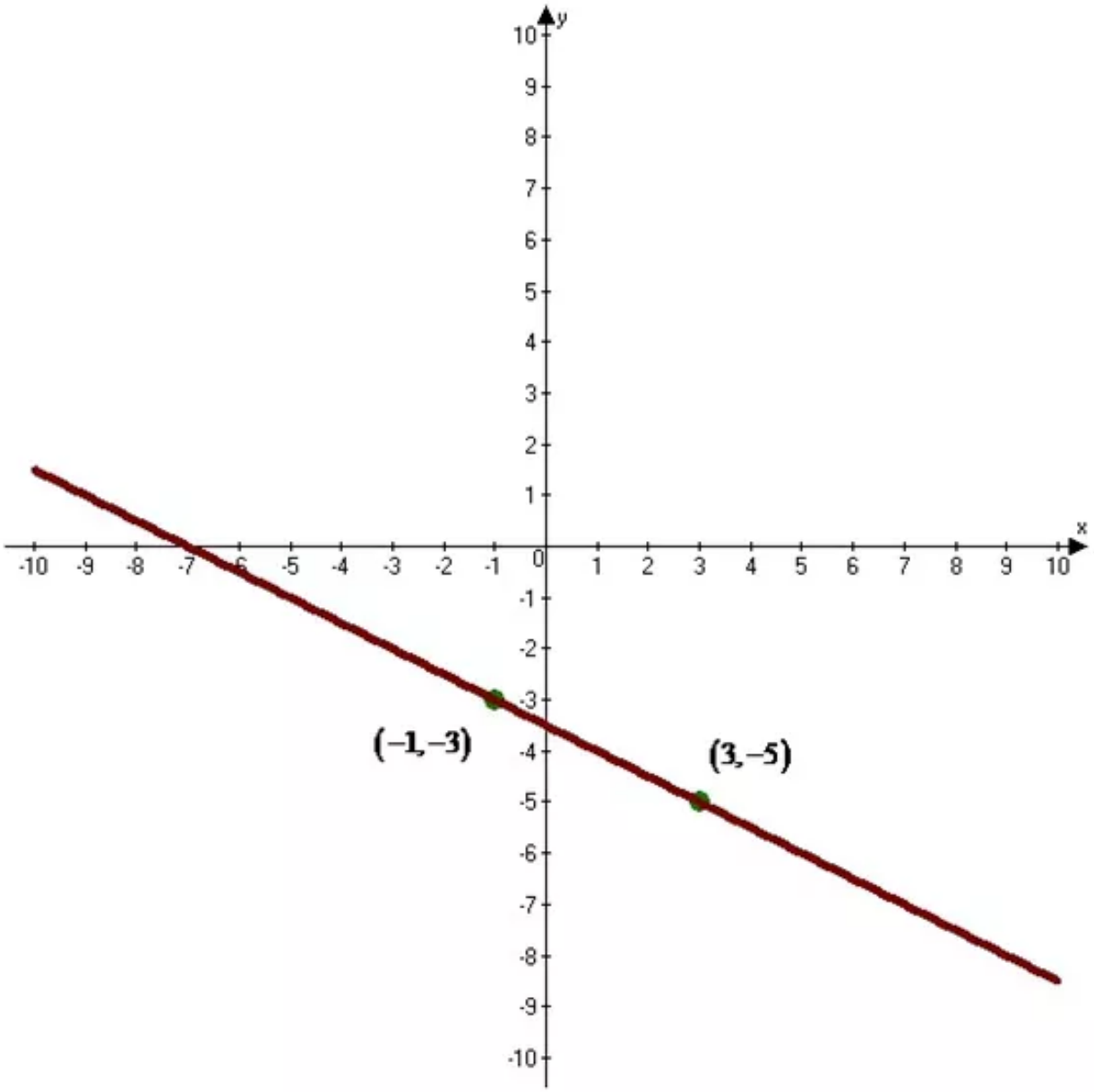
Chapter 5. Analyzing Linear Equations

Ex. 5.1

Answer 1CU.

Consider the graph



Need to explain how you would find the slope of the line

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2) can be calculated as

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Let us consider $(x_1, y_1) = (3, -5)$ and $(x_2, y_2) = (-1, -3)$

For finding the slope of the line passing through the points, substituting $(x_1, y_1) = (3, -5)$ and $(x_2, y_2) = (-1, -3)$ in $m = \frac{y_2 - y_1}{x_2 - x_1}$

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-3 - (-5)}{-1 - 3} && \text{Replace } x_1 = 3, y_1 = -5, x_2 = -1 \text{ and } y_2 = -3 \\ &= \frac{2}{-4} && \text{Simplify} \\ &= -\frac{1}{2} \end{aligned}$$

Thus the slope of the line passing through the points is $\boxed{-\frac{1}{2}}$.

Answer 1RM.

Need to find the mathematical meaning of function compare to the everyday meaning

In mathematical meaning a relationship in which the output depends upon the input

But in everyday meaning the action for which one is particularly fitted or employed, an official ceremony or a formal social occasion

And something closely related to another thing and dependent on it for its existence, value, or significance.

Answer 2CU.

Need to draw the graph of a line having each slope

a)

Need to draw the graph of a line having positive slope

Let $(x_1, y_1) = (1, 3)$ and $(x_2, y_2) = (4, 5)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2) can be calculated as follows

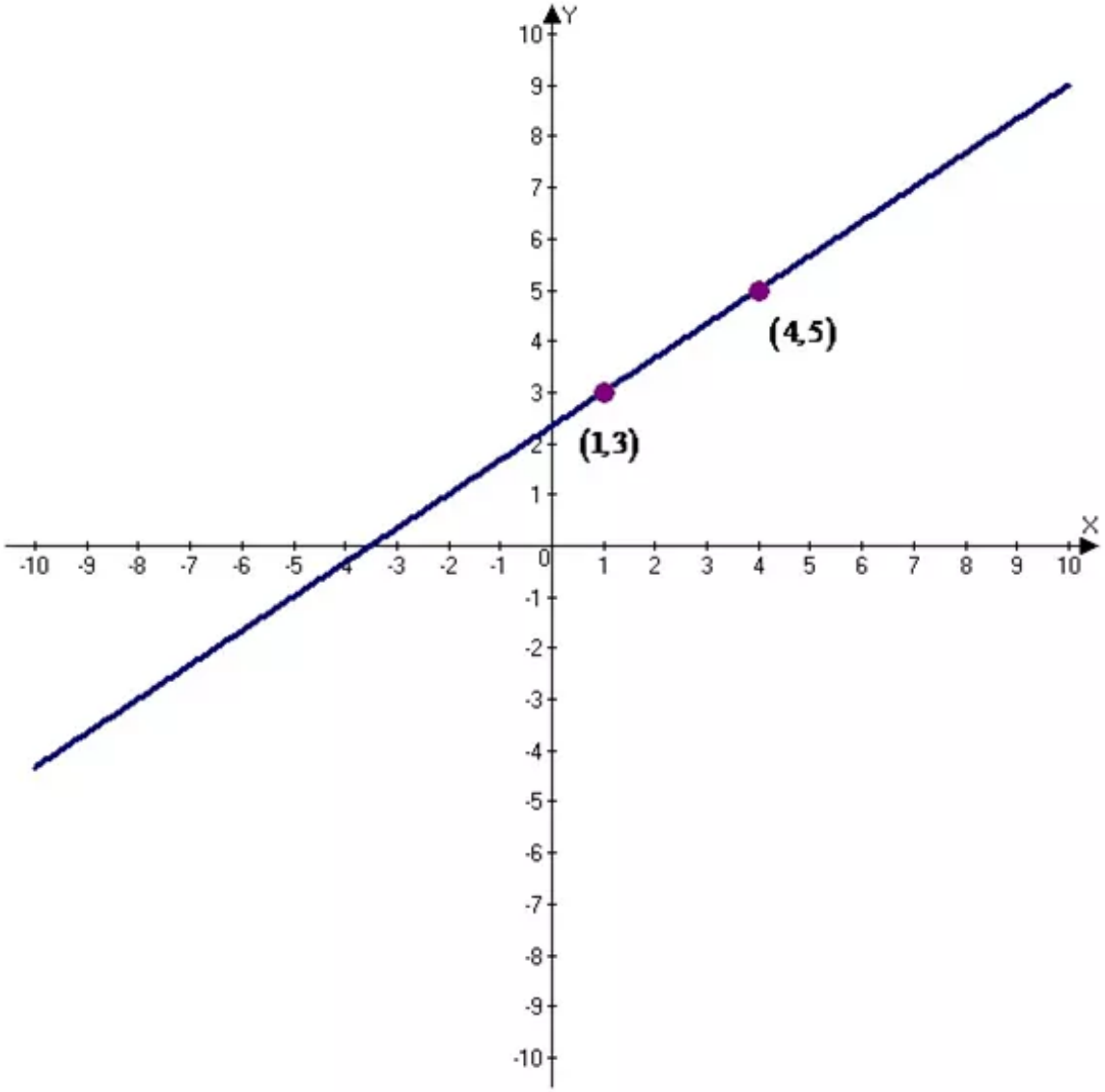
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Substituting the values we get

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{5 - 3}{4 - 1} \\ &= \frac{2}{3} \end{aligned}$$

Thus the positive slope of the line is $\boxed{\frac{2}{3}}$

The graph of a line having positive slope is shown below



Thus the graph of the positive slope is drawn.

b)

Need to draw the graph of a line having negative slope

Let $(x_1, y_1) = (-3, 6)$ and $(x_2, y_2) = (2, 4)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Substituting the values

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \frac{\text{rise}}{\text{run}}$$

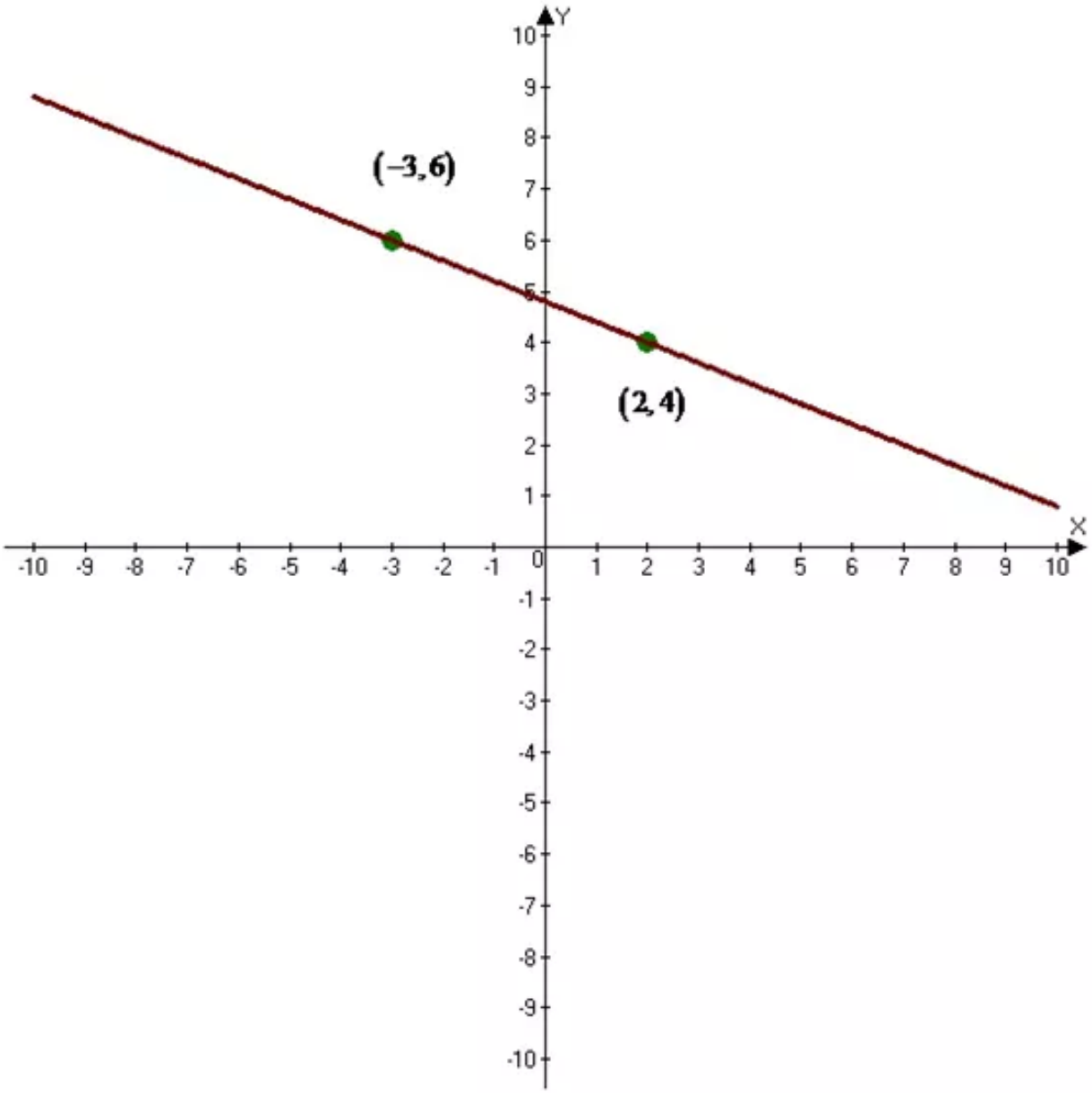
$$= \frac{4 - 6}{2 - (-3)} \qquad \text{Substitute}$$

$$= \frac{-2}{2 + 3}$$

$$= -\frac{2}{5}$$

Thus the slope of the line passing through the points is $\boxed{-\frac{2}{5}}$.

The graph of the negative slope is shown below



c)

Need to draw the graph of the line having slope of 0

Let $(x_1, y_1) = (-2, 3)$ and $(x_2, y_2) = (8, 3)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Substituting the values

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \frac{\text{rise}}{\text{run}}$$

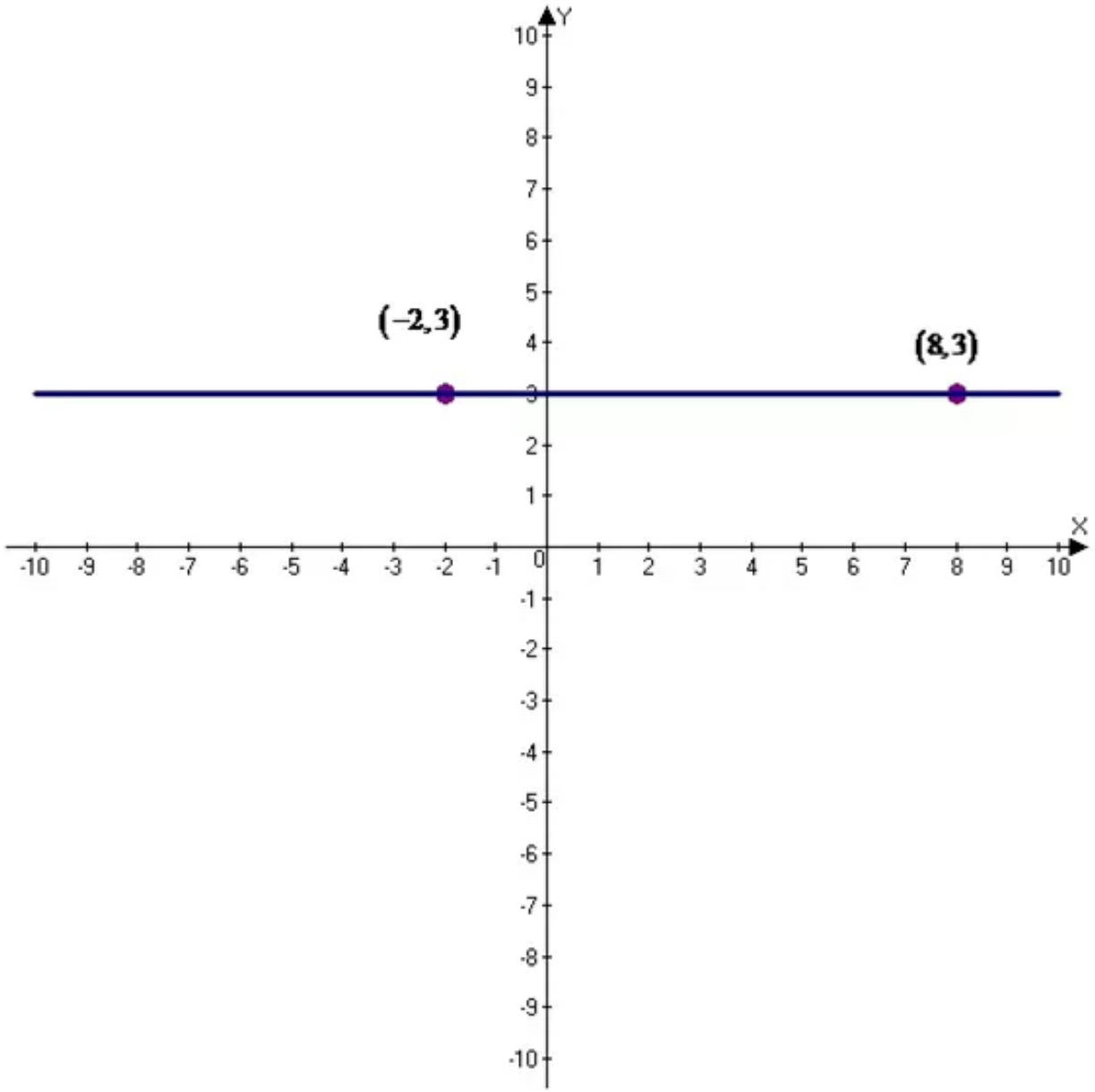
$$= \frac{3-3}{8-(-2)} \qquad \text{Substitute}$$

$$= \frac{0}{10}$$

$$= 0$$

Thus the slope of the line passing through the points is $\boxed{0}$.

The graph of the slope having zero is shown below



d)

Need to draw the graph of a line having undefined slope

Let $(x_1, y_1) = (-5, 4)$ and $(x_2, y_2) = (-5, -1)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Substituting the values

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \frac{\text{rise}}{\text{run}}$$

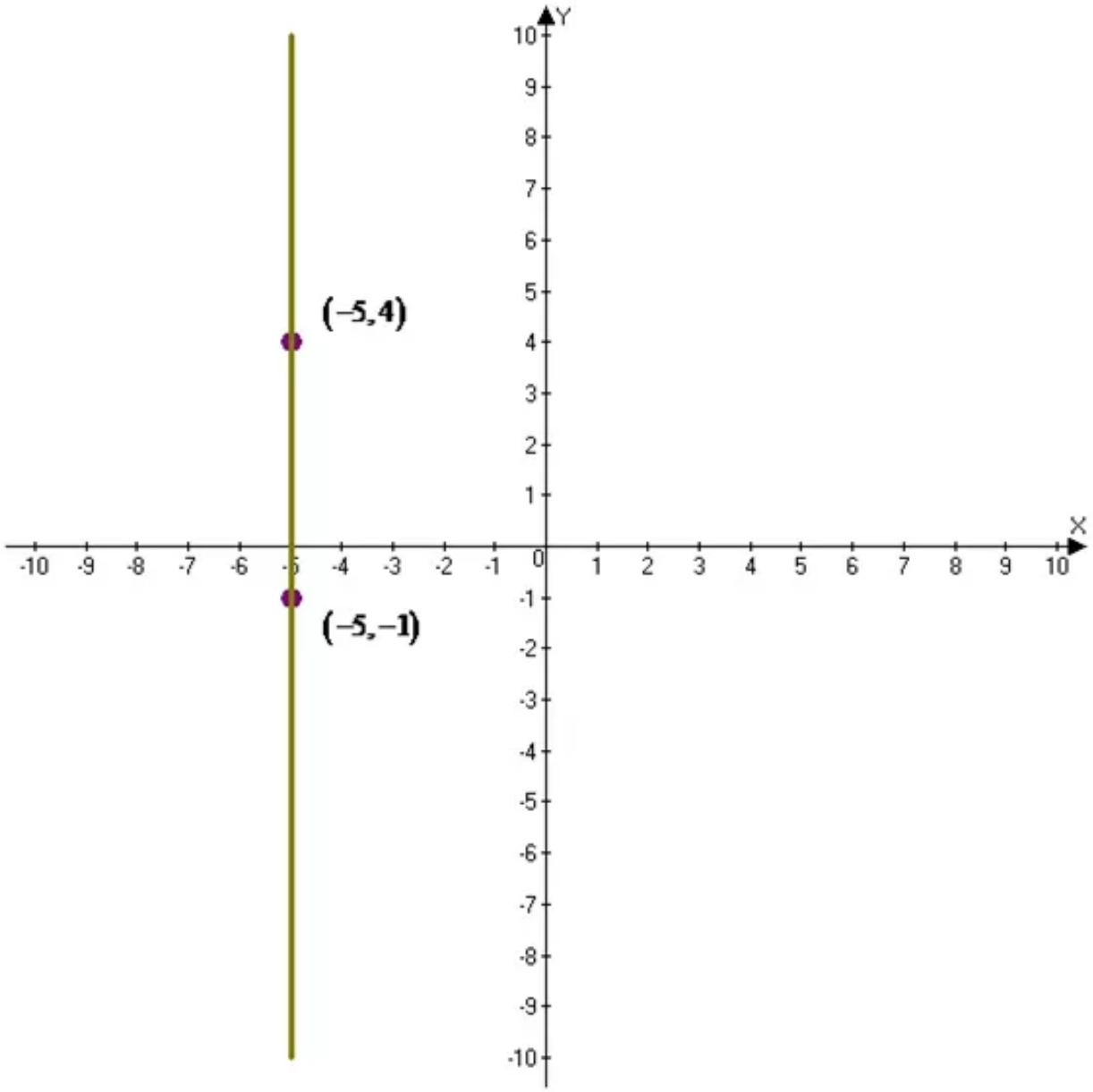
$$= \frac{-1 - 4}{-5 - (-5)} \qquad \text{Substitute}$$

$$= \frac{-5}{0}$$

Undefined

Thus the slope of the line passing through the points is $\boxed{\text{Undefined}}$.

The graph of a line having undefined slope is shown below



Answer 3CU.

Need to explain why the formulae for determining slope using the coordinates of two points does not apply to vertical lines

A vertical line has an equation in the form of $x = a$, here a is the x-intercept

When the line is exactly a vertical line it does not have a defined slope because the two x coordinates are same. So the difference is same

The slope calculation is then something like $\frac{2}{0}$, when you divide anything by zero then there is no result because it is undefined

So it has undefined slope

Answer 4CU.

Consider the Carlos and Allison is finding the slope of the line that passes through $(2,6)$ and $(5,3)$

Carlos	Allison
$\frac{3-6}{5-2}=\frac{-3}{3}=-1$	$\frac{6-3}{5-2}=\frac{3}{3}=1$

Need to find the error and explain your reasoning

Let $(x_1, y_1) = (2,6)$ and $(x_2, y_2) = (5,3)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2) can be found as follows

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Substituting the values $(x_1, y_1) = (2,6)$ and $(x_2, y_2) = (5,3)$ in $m = \frac{y_2 - y_1}{x_2 - x_1}$ we get

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{3-6}{5-2} \qquad \text{Replacing } x_1 = 2, y_1 = 6, x_2 = 5 \text{ and } y_2 = 3 \\ &= \frac{-3}{3} \\ &= -1 \end{aligned}$$

Hence Carlos is correct.

Answer 5CU.

Consider the pair of points $(1,1), (3,4)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1, y_1) = (1,1)$ and $(x_2, y_2) = (3,4)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2) can be found as follows

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Substituting the values $(x_1, y_1) = (1,1)$ and $(x_2, y_2) = (3,4)$ in $m = \frac{y_2 - y_1}{x_2 - x_1}$ we get

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{4-1}{3-1} \qquad \text{Replacing } x_1 = 1, y_1 = 1, x_2 = 3 \text{ and } y_2 = 4 \\ &= \frac{3}{2} \end{aligned}$$

Thus the slope of the line passing through the points is $\boxed{\frac{3}{2}}$

Answer 6CU.

Consider the pair of points $(0,0),(5,4)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(0,0)$ and $(x_2,y_2)=(5,4)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2) can be found as follows

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values $(x_1,y_1)=(0,0)$ and $(x_2,y_2)=(5,4)$ in $m=\frac{y_2-y_1}{x_2-x_1}$ we get

$$\begin{aligned} m&=\frac{y_2-y_1}{x_2-x_1}\\ &=\frac{4-0}{5-0} \qquad \text{Replacing } x_1=0, y_1=0, x_2=5 \text{ and } y_2=4\\ &=\frac{4}{5} \end{aligned}$$

Thus the slope of the line passing through the points is $\boxed{\frac{4}{5}}$.

Answer 7CU.

Consider the pair of points $(-2,2),(-1,-2)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(-2,2)$ and $(x_2,y_2)=(-1,-2)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2) can be found as follows

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values $(x_1,y_1)=(-2,2)$ and $(x_2,y_2)=(-1,-2)$ in $m=\frac{y_2-y_1}{x_2-x_1}$ we get

$$\begin{aligned} m&=\frac{y_2-y_1}{x_2-x_1}\\ &=\frac{-2-2}{-1-(-2)} \qquad \text{Replacing } x_1=-2, y_1=2, x_2=-1 \text{ and } y_2=-2\\ &=\frac{-4}{1}\\ &=-4 \end{aligned}$$

Thus the slope of the line passing through the points is $\boxed{-4}$.

Answer 8CU.

Consider the pair of points $(7,-4),(9,-1)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(7,-4)$ and $(x_2,y_2)=(9,-1)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2) can be found as follows

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values $(x_1,y_1)=(7,-4)$ and $(x_2,y_2)=(9,-1)$ in $m=\frac{y_2-y_1}{x_2-x_1}$ we get

$$\begin{aligned} m&=\frac{y_2-y_1}{x_2-x_1}\\ &=\frac{-1-(-4)}{9-7} \qquad \text{Replacing } x_1=7, y_1=-4, x_2=9 \text{ and } y_2=-1\\ &=\frac{-1+4}{2}\\ &=\frac{3}{2} \end{aligned}$$

Thus the slope of the line passing through the points is $\boxed{\frac{3}{2}}$.

Answer 9CU.

Consider the pair of points $(3,5),(-2,5)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(3,5)$ and $(x_2,y_2)=(-2,5)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2) can be found as follows

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values $(x_1,y_1)=(3,5)$ and $(x_2,y_2)=(-2,5)$ in $m=\frac{y_2-y_1}{x_2-x_1}$ we get

$$\begin{aligned} m&=\frac{y_2-y_1}{x_2-x_1}\\ &=\frac{5-5}{-2-3} \qquad \text{Replacing } x_1=3, y_1=5, x_2=-2 \text{ and } y_2=5\\ &=\frac{0}{-5}\\ &=0 \end{aligned}$$

Thus the slope of the line passing through the points is $\boxed{0}$.

Answer 10CU.

Consider the pair of points $(-1,3),(-1,0)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(-1,3)$ and $(x_2,y_2)=(-1,0)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2) can be found as follows

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values $(x_1,y_1)=(-1,3)$ and $(x_2,y_2)=(-1,0)$ in $m=\frac{y_2-y_1}{x_2-x_1}$ we get

$$\begin{aligned} m&=\frac{y_2-y_1}{x_2-x_1}\\ &=\frac{0-3}{-1-(-1)} \qquad \text{Replacing } x_1=-1, y_1=3, x_2=-1 \text{ and } y_2=0\\ &=\frac{-3}{0}\\ &\text{Undefined} \end{aligned}$$

Thus the slope of the line passing through the points is $\boxed{\text{Undefined}}$.

Answer 11CU.

Consider the pair of points $(6,-2),(r,-6)$ has the slope $m=4$

Need to find the value of r that the line passes through each pair of points has the given slope

Let us take $(x_1,y_1)=(6,-2)$ and $(x_2,y_2)=(r,-6)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2) is $m=\frac{y_2-y_1}{x_2-x_1}$

Substituting the values we get

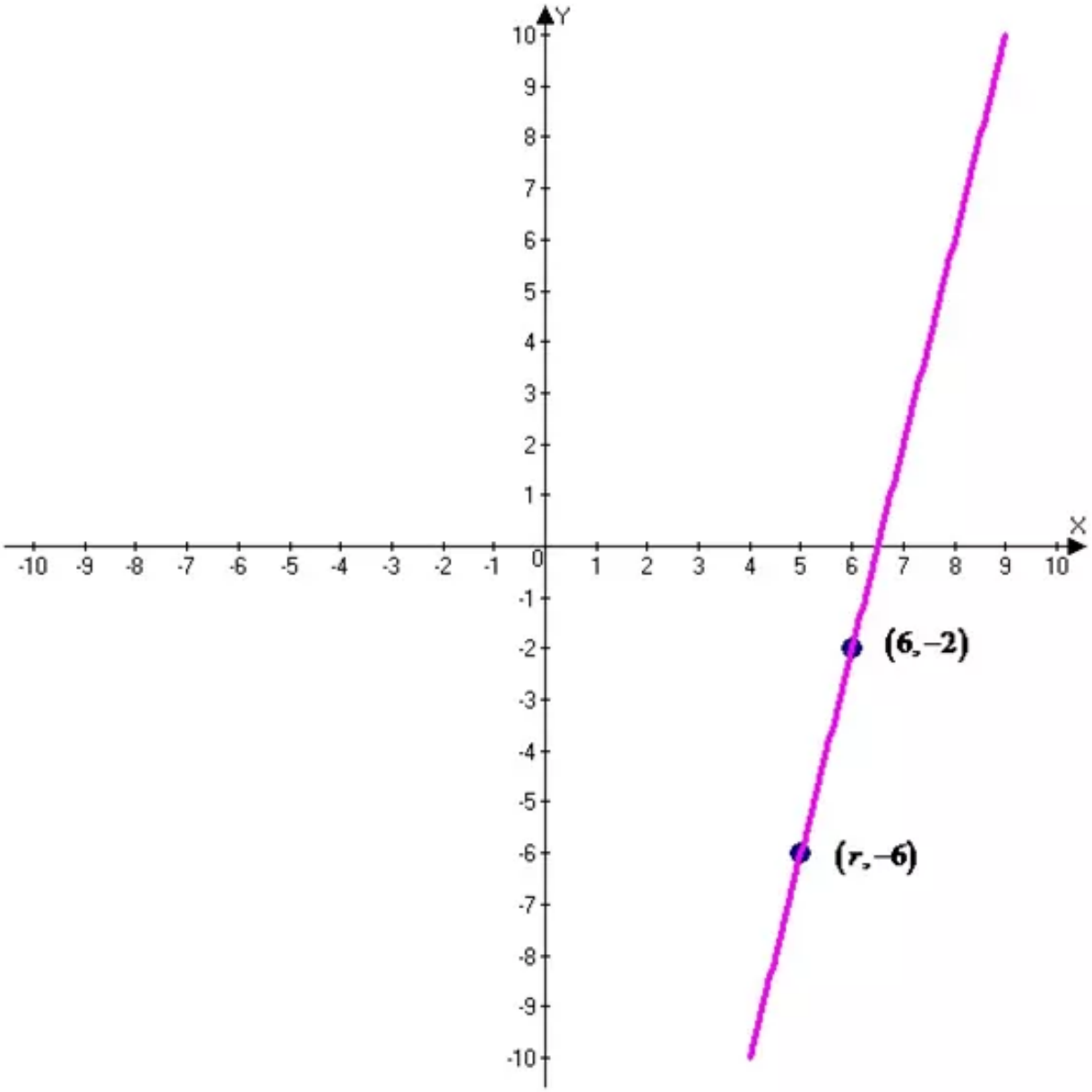
$$\begin{aligned} m&=\frac{y_2-y_1}{x_2-x_1} && \text{Slope formulae}\\ 4&=\frac{-6-(-2)}{r-6} && \text{Substitute}\\ 4&=\frac{-4}{r-6} && \text{Subtract}\\ 4(r-6)&=-4 && \text{Find the cross products} \end{aligned}$$

By distributive property

$$\begin{aligned} 4r-24&=-4\\ 4r-24+24&=-4+24 && \text{Adding 24 on both sides}\\ 4r&=20\\ r&=5 && \text{Dividing both sides by 5} \end{aligned}$$

Thus the value of r is $\boxed{5}$

The graph is shown below



Answer 12CU.

Consider the pair of points $(9,r),(6,3)$ has the slope $m=-\frac{1}{3}$

Need to find the value of r that the line passes through each pair of points has the given slope

Let us take $(x_1,y_1)=(9,r)$ and $(x_2,y_2)=(6,3)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2) is $m=\frac{y_2-y_1}{x_2-x_1}$

Substituting the values we get

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \text{Slope formulae}$$

$$-\frac{1}{3}=\frac{3-r}{6-9} \qquad \text{Substitute}$$

$$-\frac{1}{3}=\frac{3-r}{-3} \qquad \text{Subtract}$$

$$-3(-1)=3(3-r) \qquad \text{Find the cross products}$$

By distributive property

$$9-3r=3$$

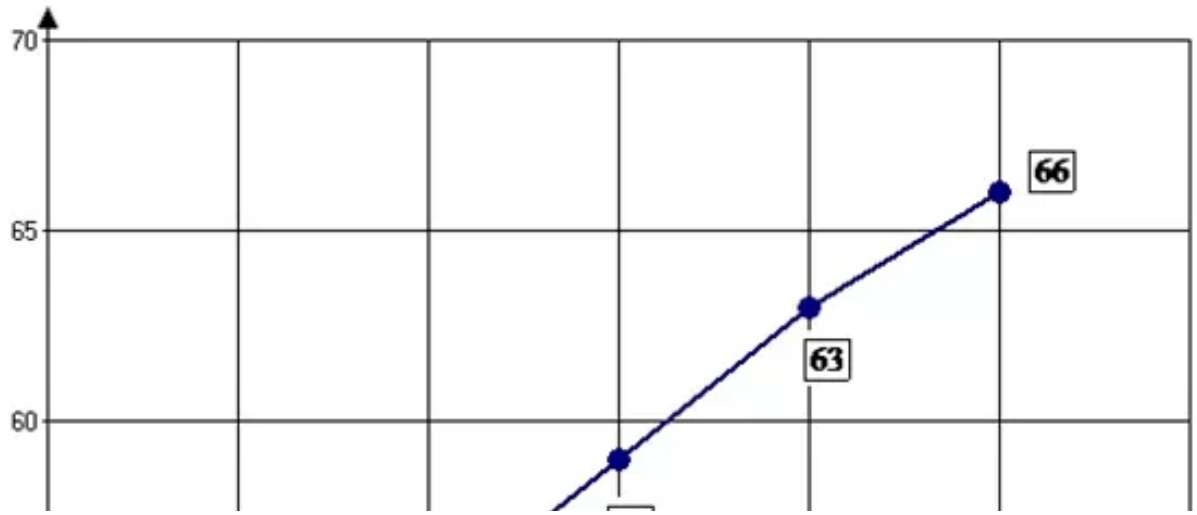
$$-3r=-6 \qquad \text{Adding } -9 \text{ on both sides}$$

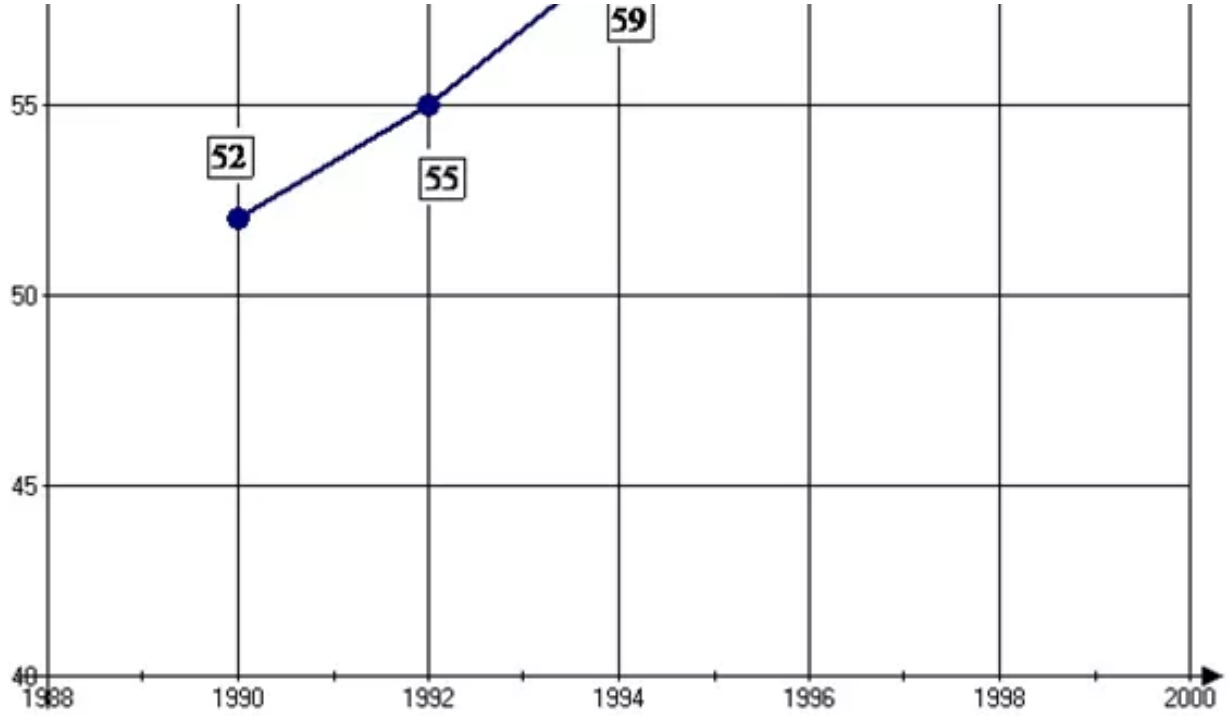
$$\frac{-3r}{-3}=\frac{-6}{-3} \qquad \text{Dividing both sides by } -3$$

$$r=2$$

Answer 13CU.

Consider the graph





Need to find the rate of change for 1990-1992

Let us take $(x_1, y_1) = (1990, 52)$ and $(x_2, y_2) = (1992, 55)$

Equation of the line passing though the points (x_1, y_1) and (x_2, y_2) is given by

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$ Slope-formulae

$$m = \frac{55 - 52}{1992 - 1990}$$ Replace $x_1 = 1990, y_1 = 52, x_2 = 1992, y_2 = 55$

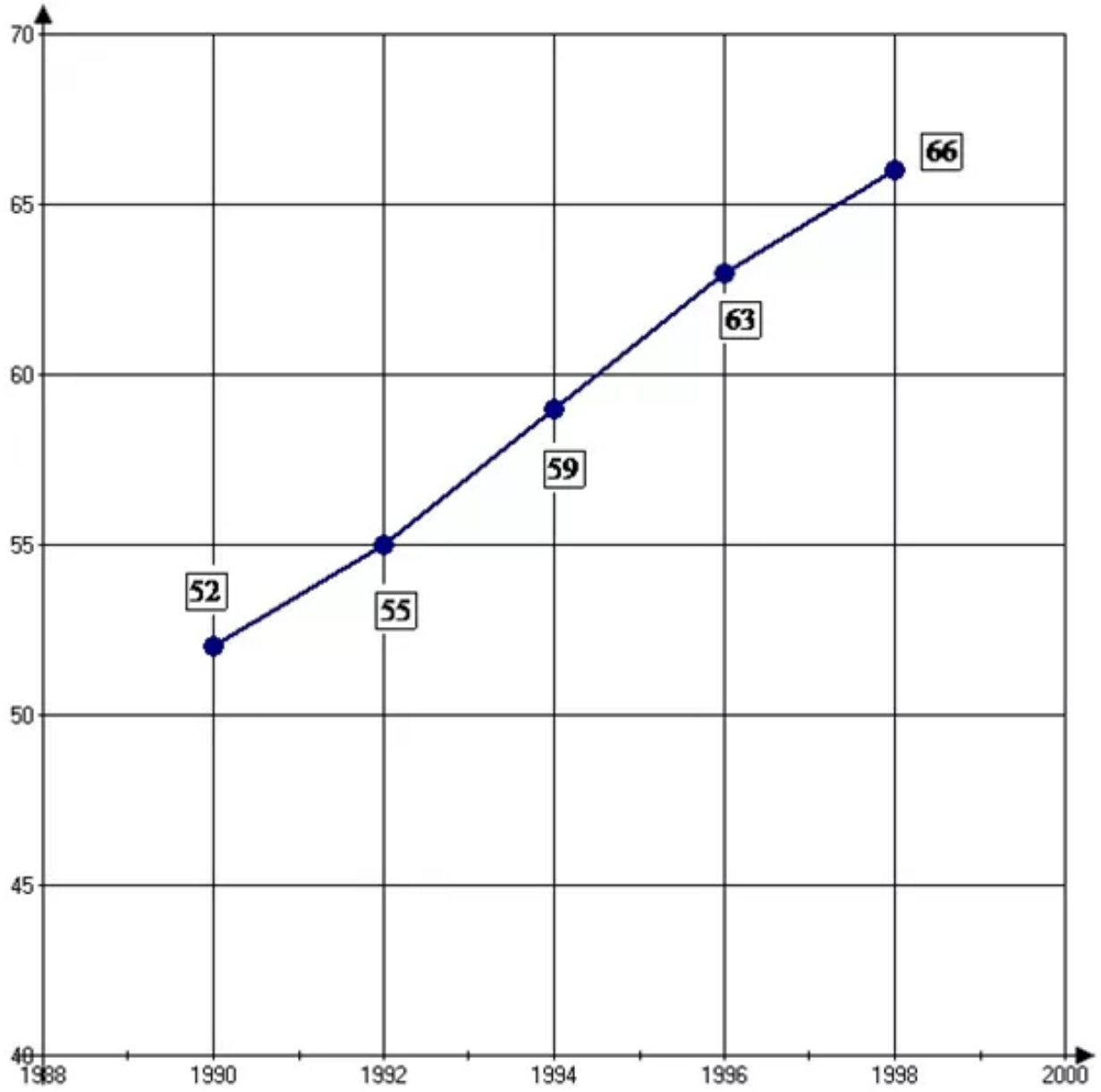
$$m = \frac{3}{2}$$ Simplify

$$m = 1.5$$

Thus the rate of change for the period of 1990-1992 is $\boxed{\text{1.5 million suscribers per year}}$

Answer 14CU.

Consider the graph



Need to find which two year period that had a greater rate of change than $1990-1992$ explain your reasoning

For the period of 1992-1994 had a greater rate of change than 1990-1992

The rate of change for 1990-1992

Let us take $(x_1, y_1) = (1990, 52)$ and $(x_2, y_2) = (1992, 55)$

Equation of the line passing though the points (x_1, y_1) and (x_2, y_2) is given by

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$ Slope-formulae

$$m = \frac{55 - 52}{1992 - 1990}$$ Replace $x_1 = 1990, y_1 = 52, x_2 = 1992, y_2 = 55$

$$m = \frac{3}{2}$$ Simplify

$$m = 1.5$$

Thus the rate of change for the period of 1990-1992 is $\boxed{\text{1.5 million suscribers per year}}$

The rate of change for $1992 - 1994$

Let us take $(x_1, y_1) = (1992, 55)$ and $(x_2, y_2) = (1994, 59)$

Equation of the line passing though the points (x_1, y_1) and (x_2, y_2) is given by

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$ Slope-formulae

$$m = \frac{59 - 55}{1994 - 1992}$$ Replace $x_1 = 1992, y_1 = 54, x_2 = 1994, y_2 = 59$

$$m = \frac{4}{2}$$ Simplify

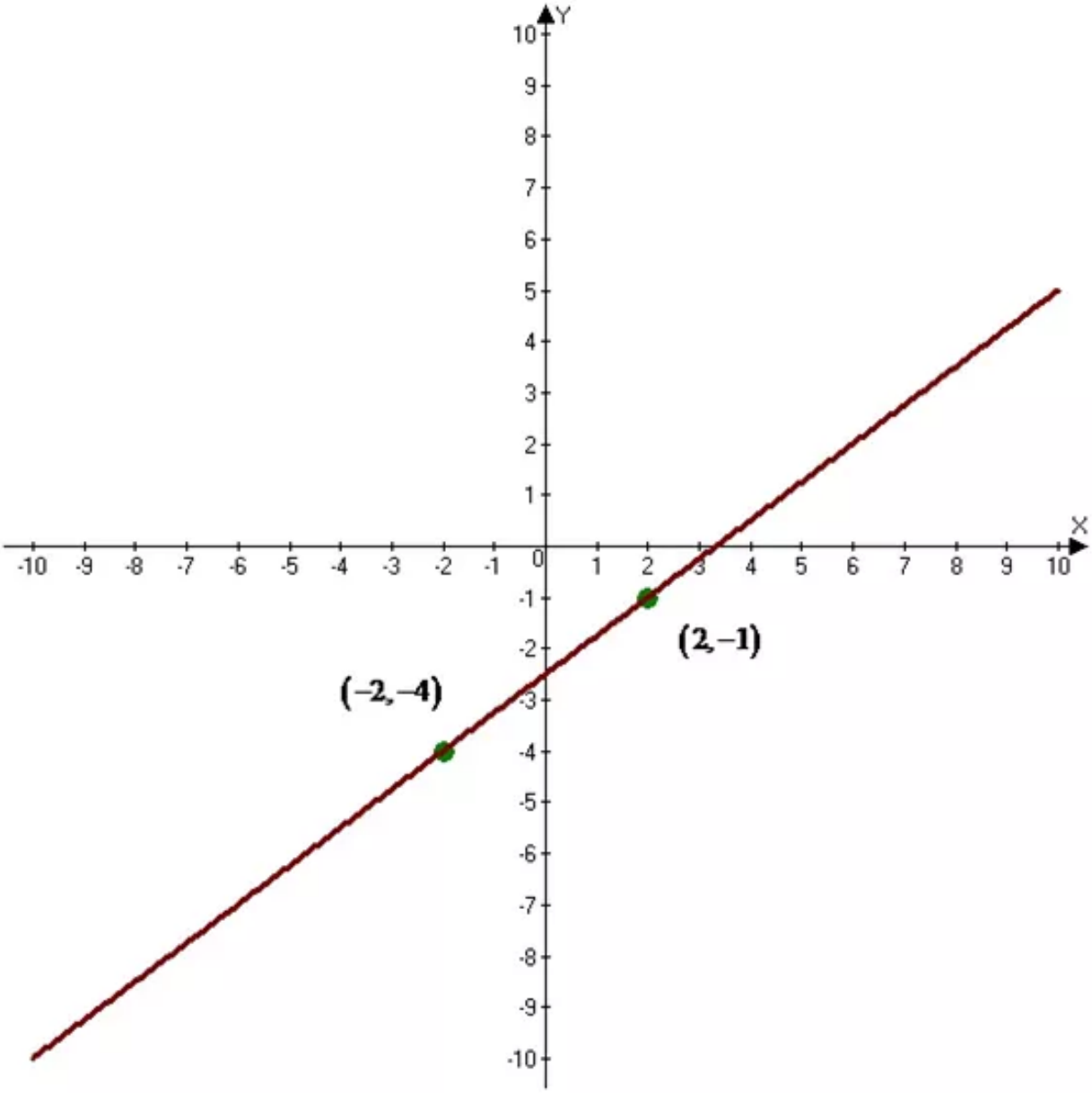
$$m = 2$$

Thus the rate of change for the period of 1992-1994 is $\boxed{\text{2 million suscribers per year}}$.

Hence the two year period $\boxed{\text{1992-1994}}$ had a greater rate of change than $\boxed{\text{1990-1992}}$.

Answer 15A.

Consider the graph



Need to find the slope of the line passes through each pair of points

Let $(x_1, y_1) = (-2, -4)$ and $(x_2, y_2) = (2, -1)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Substituting the values

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \frac{\text{rise}}{\text{run}}$$

$$= \frac{-1-(-4)}{2-(-2)} \qquad \text{Substitute}$$

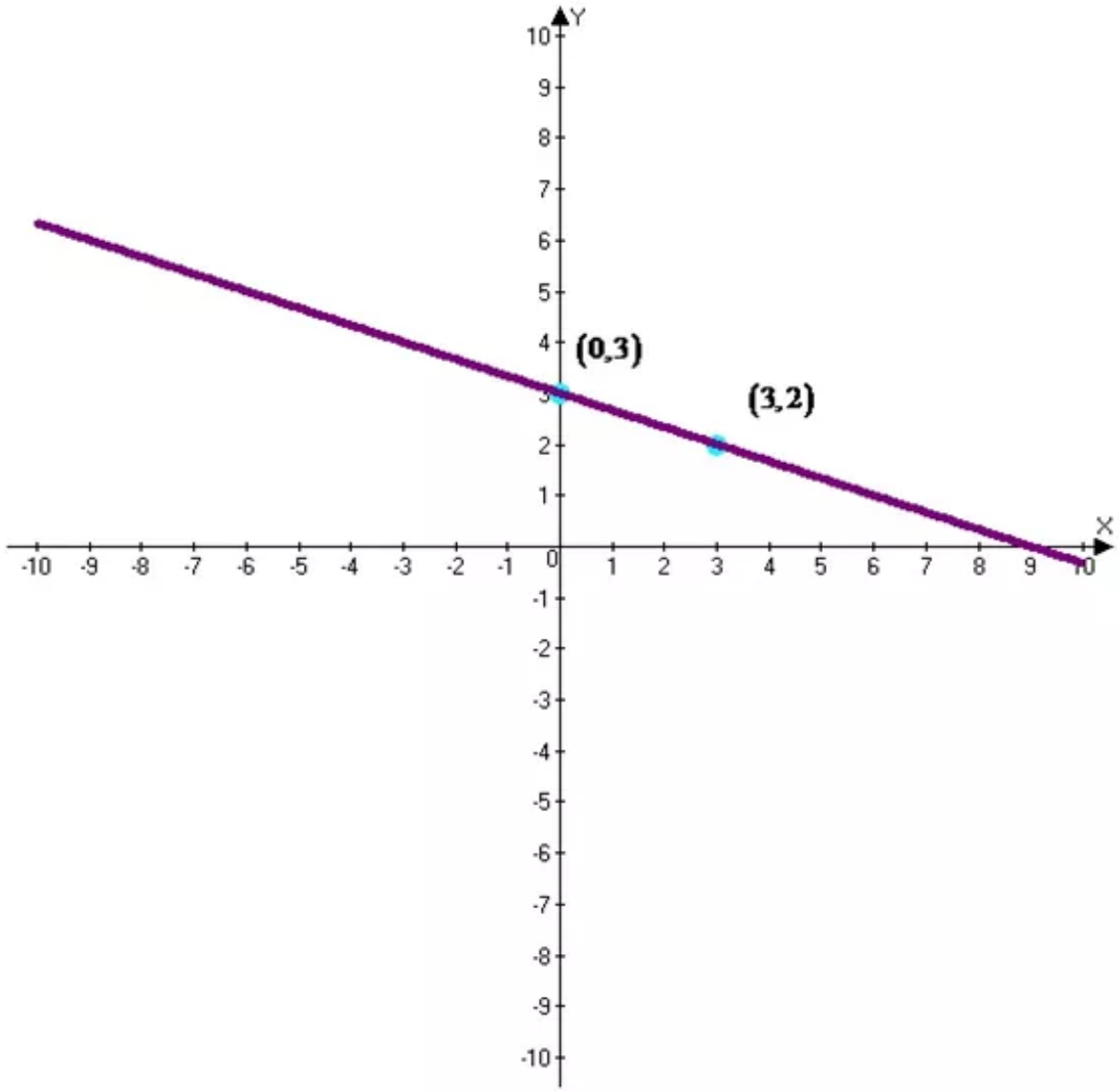
$$= \frac{-1+4}{2+2}$$

$$= \frac{3}{4} \qquad \text{Simplify}$$

Thus the slope of the line passing through the points is $\boxed{\frac{3}{4}}$.

Answer 16PA.

Consider the graph



Need to find the slope of the line passes through each pair of points

Let $(x_1, y_1) = (3, 2)$ and $(x_2, y_2) = (0, 3)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Substituting the values

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} && \frac{\text{rise}}{\text{run}} \\ &= \frac{3-2}{0-3} && \text{Substitute} \\ &= -\frac{1}{3} \end{aligned}$$

Thus the slope of the line passing through the points is $\boxed{-\frac{1}{3}}$.

Answer 17PA.

Consider the points $(-4, -1), (-3, -3)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1, y_1) = (-4, -1)$ and $(x_2, y_2) = (-3, -3)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2)

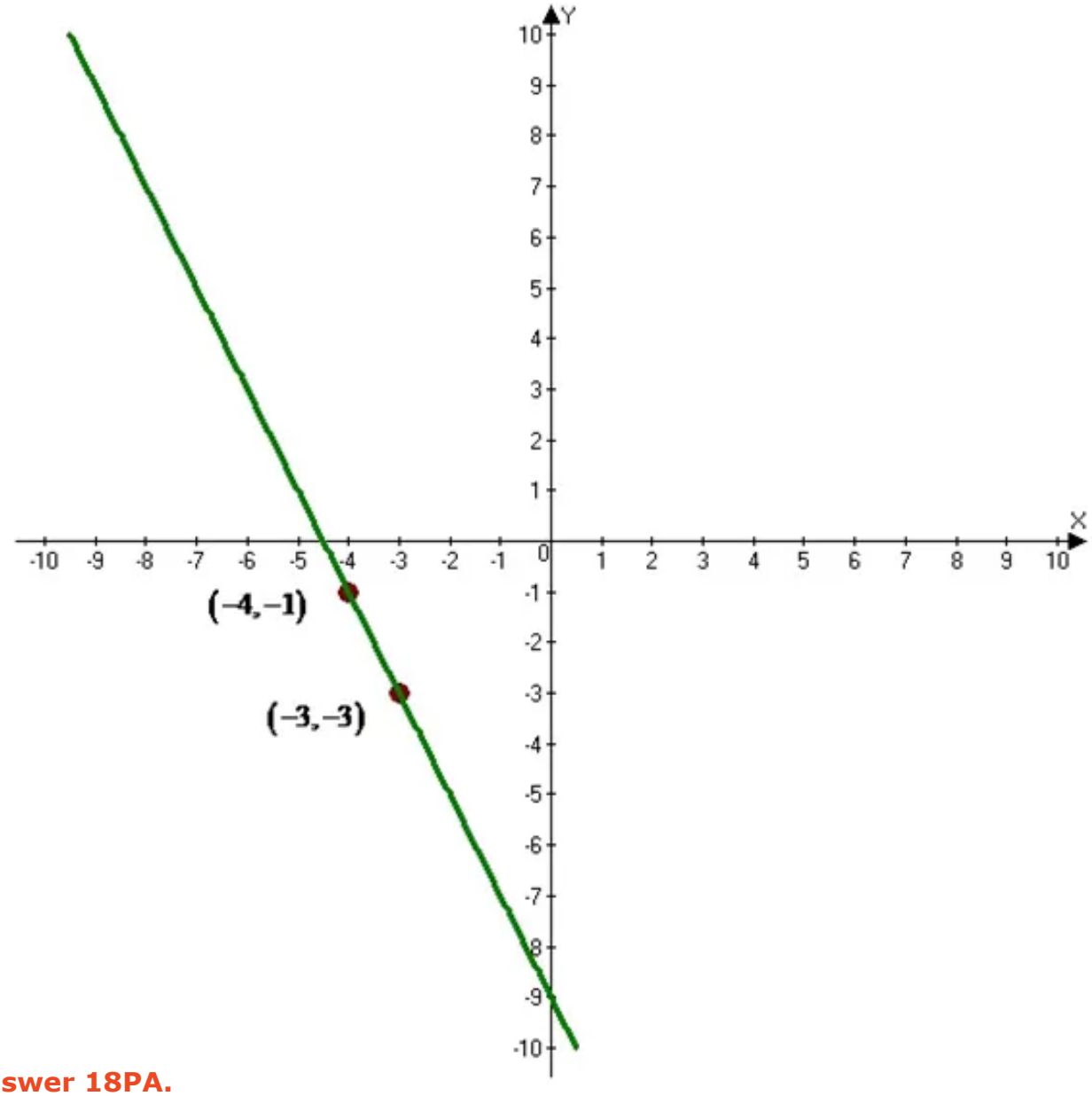
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Substituting the values

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} && \frac{\text{rise}}{\text{run}} \\ &= \frac{-3-(-1)}{-3-(-4)} && \text{Substitute} \\ &= \frac{-3+1}{-3+4} \\ &= -2 \end{aligned}$$

Thus the slope of the line passing through the points is $\boxed{-2}$.

The graph is shown below



Answer 18PA.

Consider the points $(-3,3),(1,3)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(-3,3)$ and $(x_2,y_2)=(1,3)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

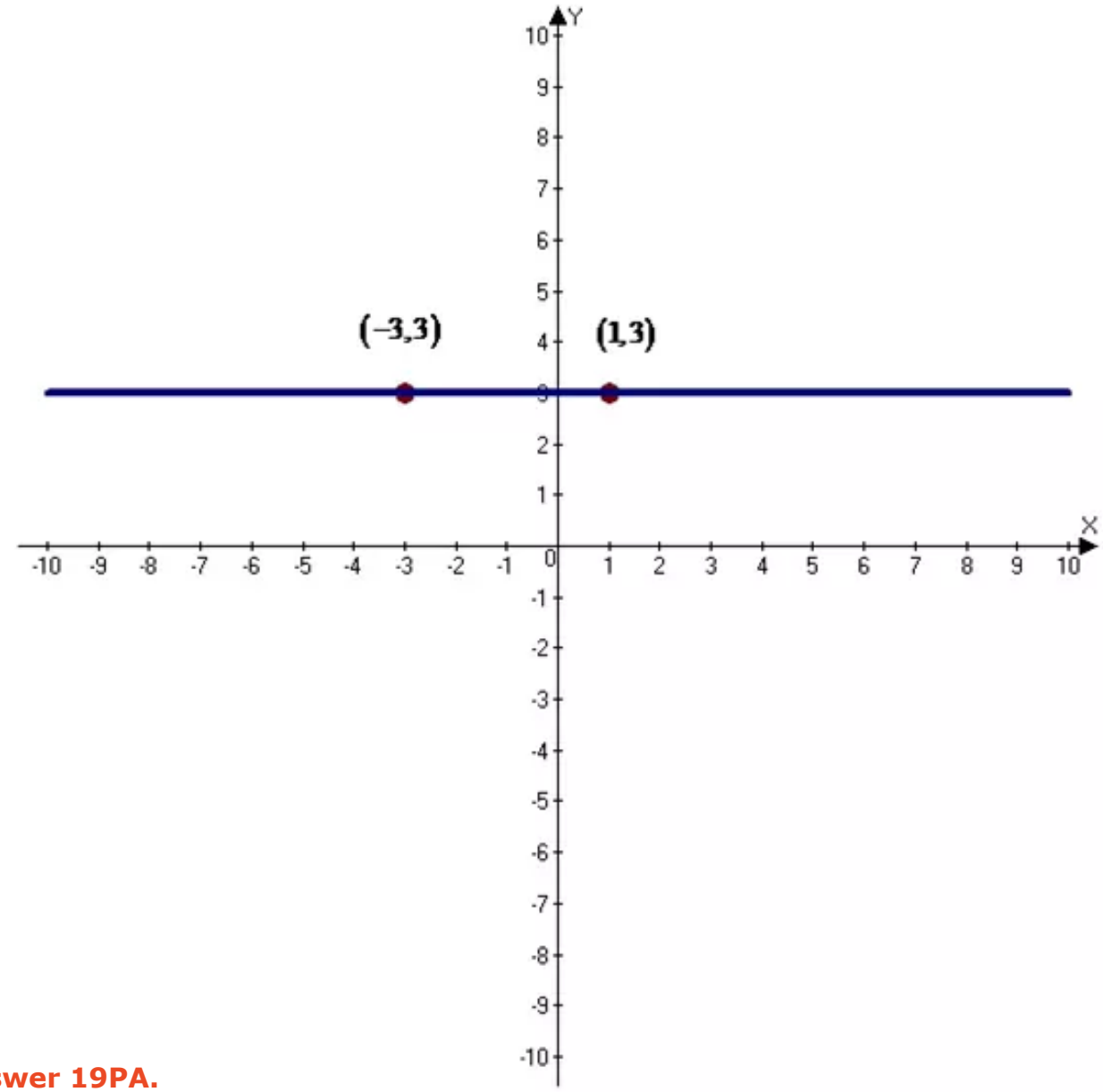
$$=\frac{3-3}{1-(-3)} \qquad \text{Substitute}$$

$$=\frac{0}{4}$$

$$=0$$

Thus the slope of the line passing through the points is $\boxed{0}$.

The graph is shown below



Answer 19PA.

Consider the points $(-2,1),(-2,3)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(-2,1)$ and $(x_2,y_2)=(-2,3)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

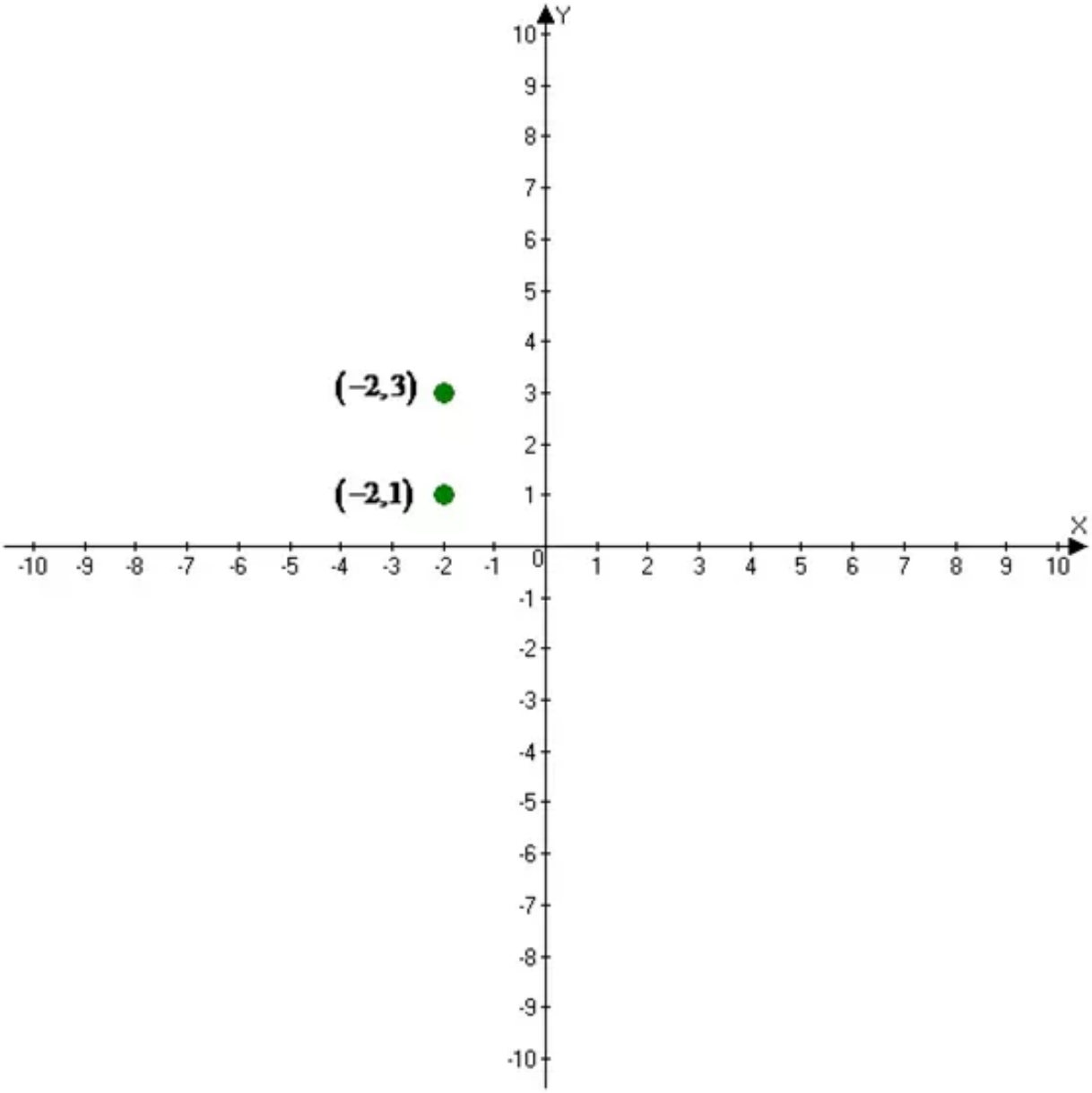
$$=\frac{3-1}{-2-(-2)} \qquad \text{Substitute}$$

$$=\frac{2}{0}$$

$$=\text{Undefined}$$

Thus the slope of the line passing through the points is $\boxed{\text{Undefined}}$.

The graph is shown below



Answer 20PA.

Consider the points $(2,3),(9,7)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(2,3)$ and $(x_2,y_2)=(9,7)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

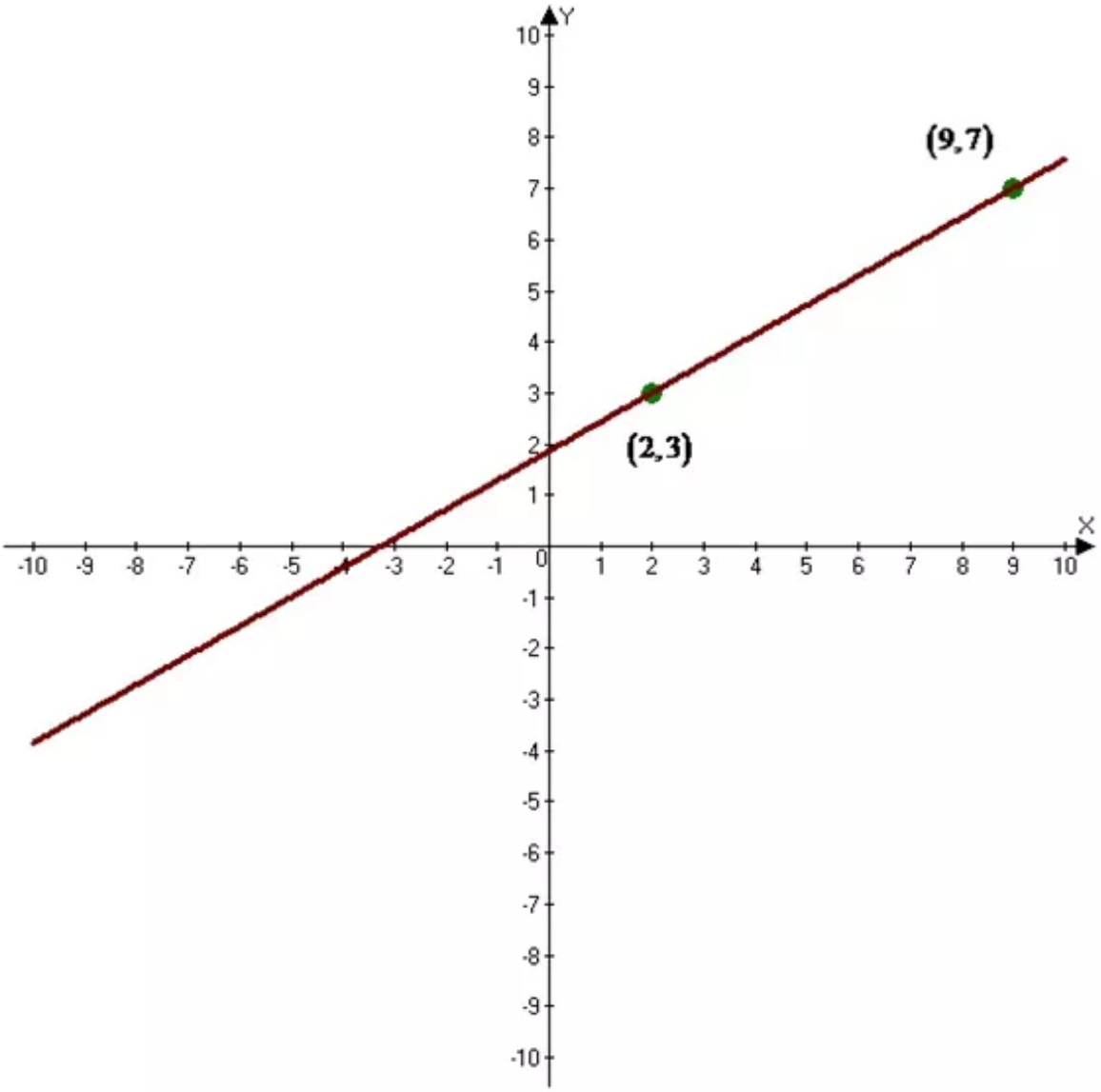
$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

$$=\frac{7-3}{9-2} \qquad \text{Substitute}$$

$$=\frac{4}{7}$$

Thus the slope of the line passing through the points is $\boxed{\frac{4}{7}}$.

The graph is shown below



Answer 21PA.

Consider the points $(5,7),(-2,-3)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(5,7)$ and $(x_2,y_2)=(-2,-3)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

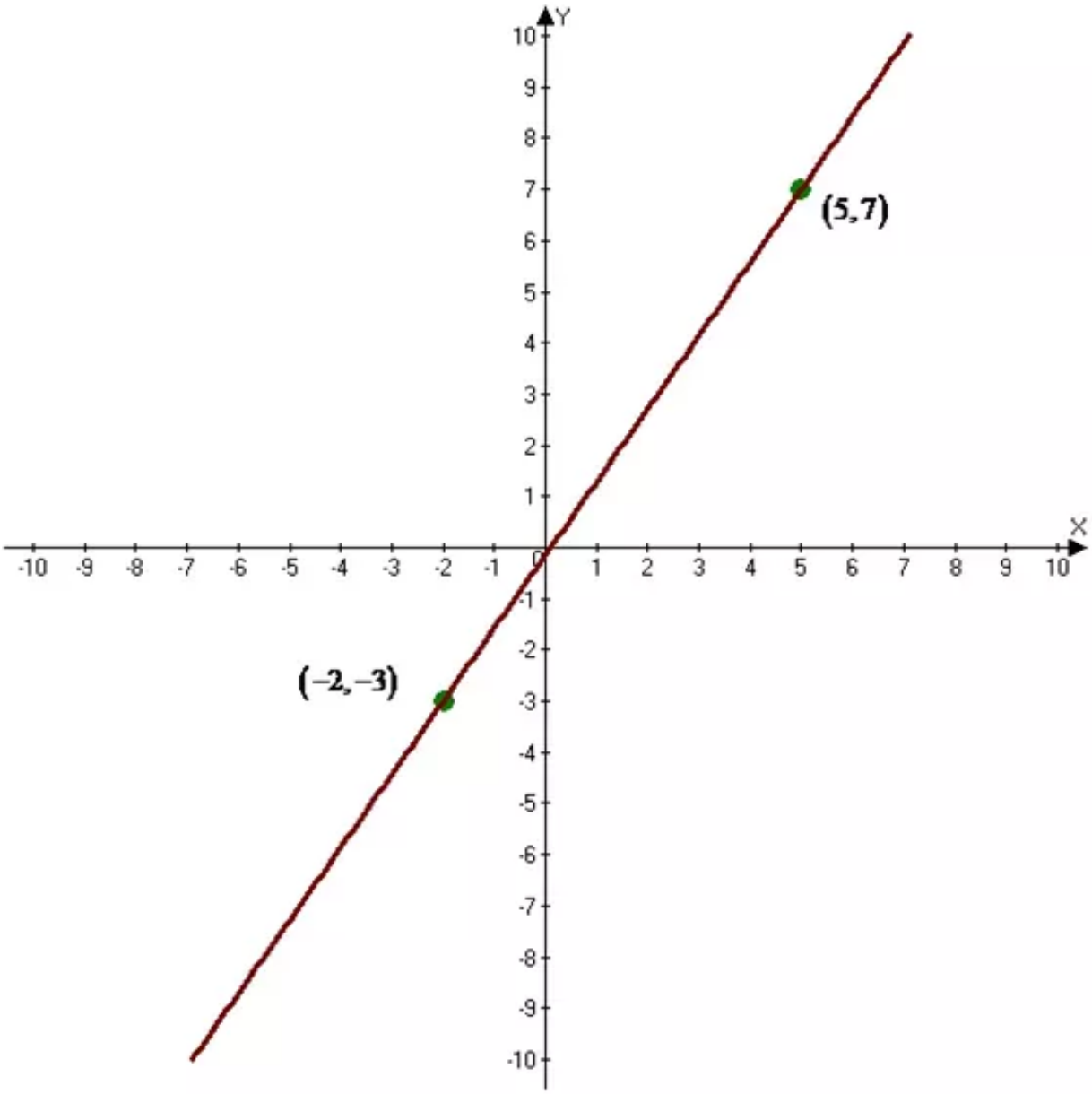
$$=\frac{-3-7}{-2-5} \qquad \text{Substitute}$$

$$=\frac{-10}{-7}$$

$$=\frac{10}{7}$$

Thus the slope of the line passing through the points is $\boxed{\frac{10}{7}}$.

The graph is shown below



Answer 22PA.

Consider the points $(-3,6),(2,4)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(-3,6)$ and $(x_2,y_2)=(2,4)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

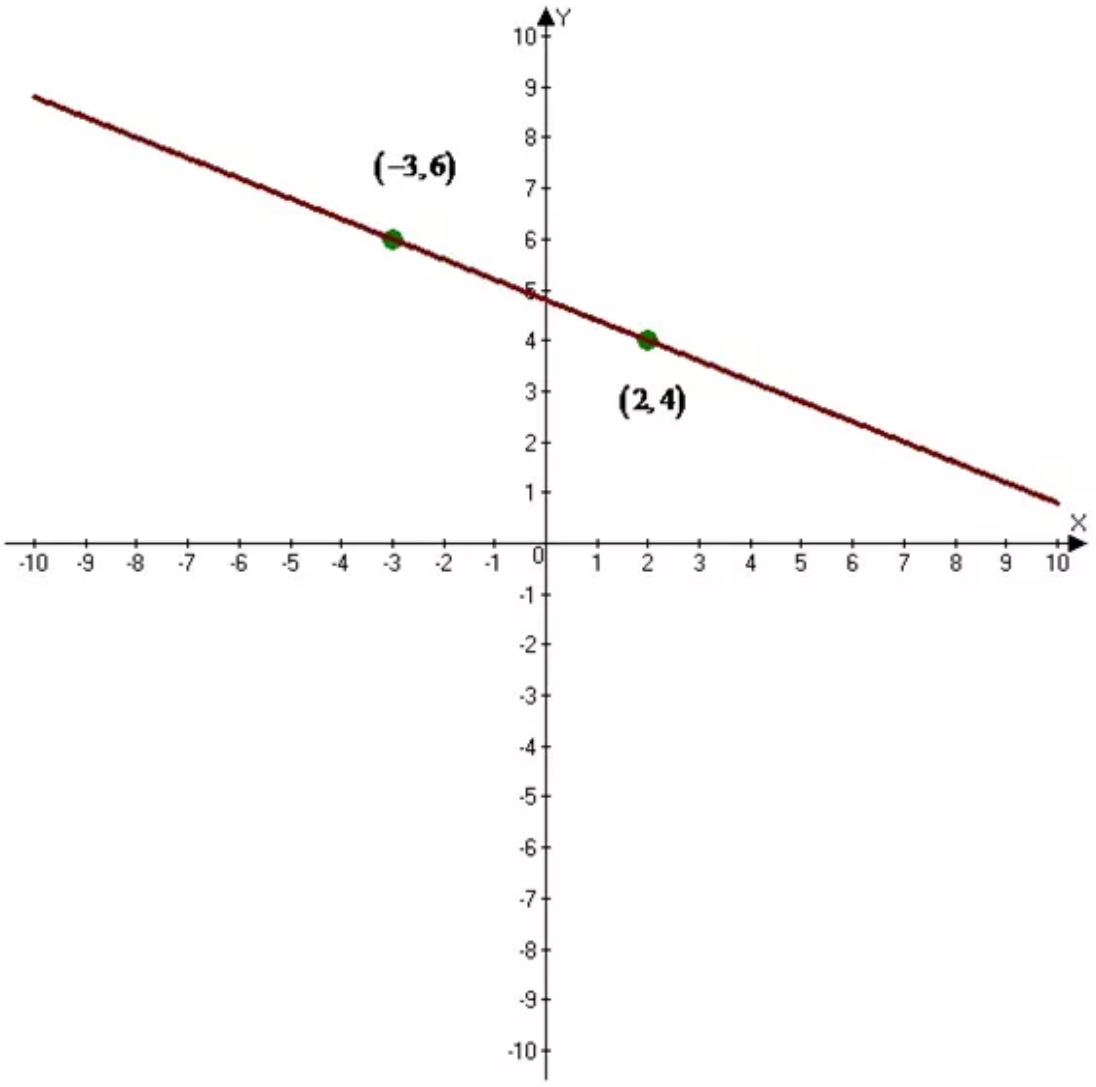
$$=\frac{4-6}{2-(-3)} \qquad \text{Substitute}$$

$$=\frac{-2}{2+3}$$

$$=-\frac{2}{5}$$

Thus the slope of the line passing through the points is $\boxed{-\frac{2}{5}}$.

The graph is shown below



Answer 23PA.

Consider the points $(-3,-4),(5,-1)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(-3,-4)$ and $(x_2,y_2)=(5,-1)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

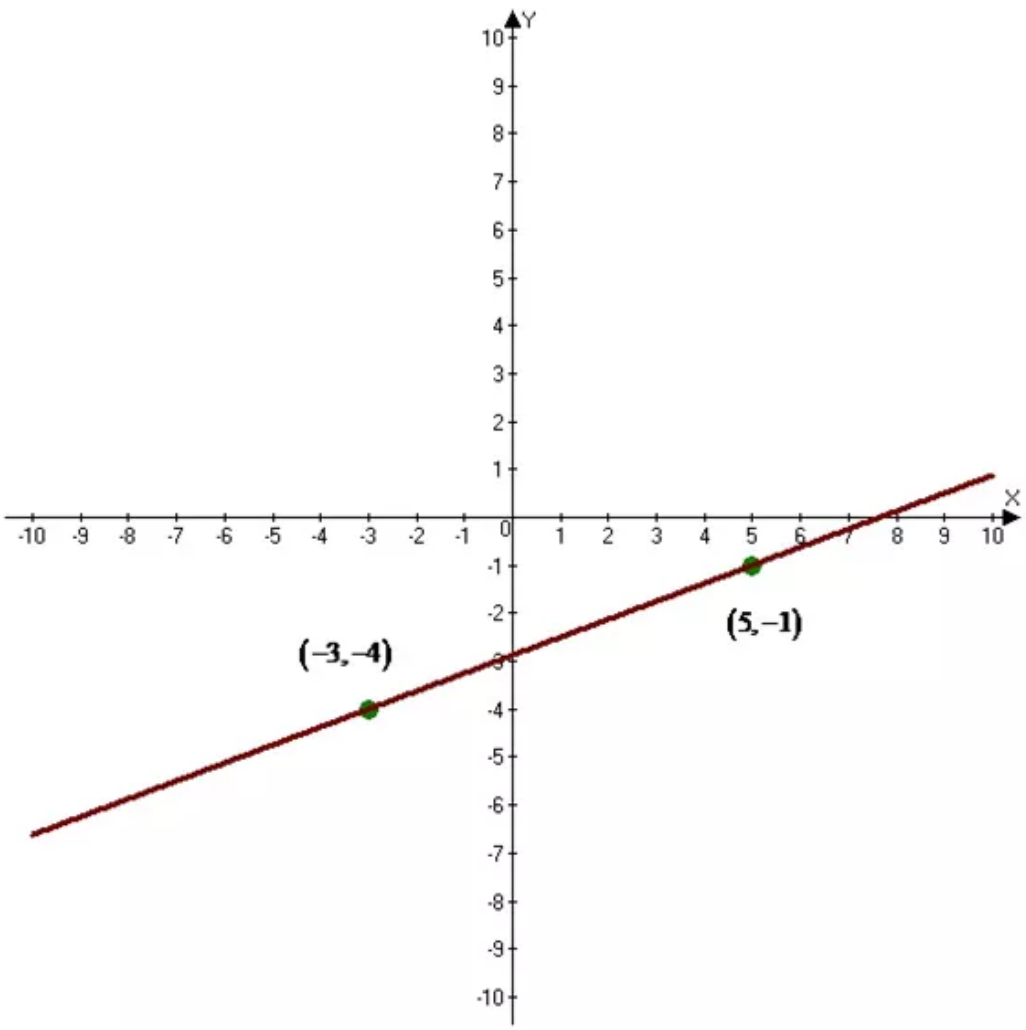
$$=\frac{-1-(-4)}{5-(-3)} \qquad \text{Substitute}$$

$$=\frac{-1+4}{5+3}$$

$$=\frac{3}{8}$$

Thus the slope of the line passing through the points is $\boxed{\frac{3}{8}}$.

The graph is shown below



Answer 24PA.

Consider the points $(2,-1),(5,-3)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(2,-1)$ and $(x_2,y_2)=(5,-3)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

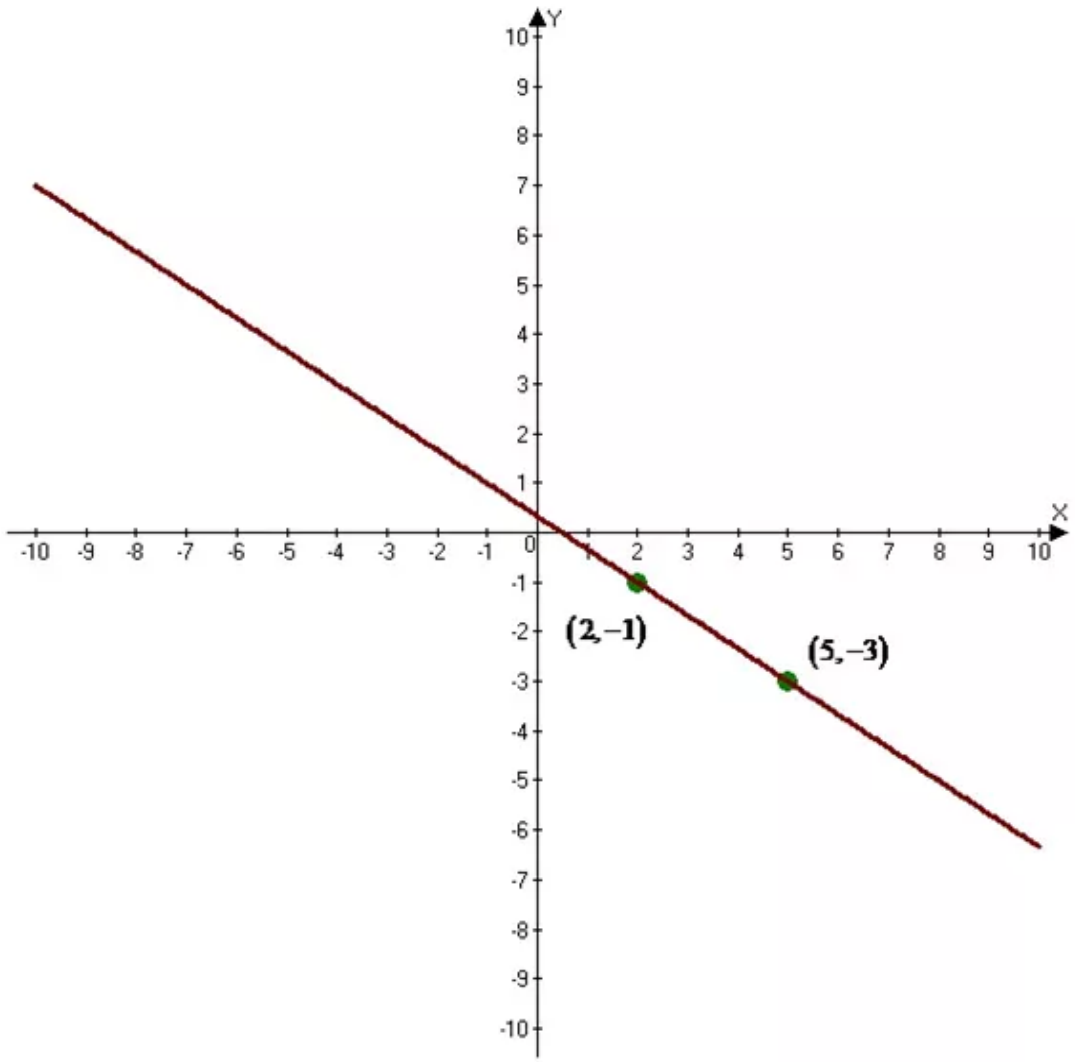
$$=\frac{-3-(-1)}{5-2} \qquad \text{Substitute}$$

$$=\frac{-3+1}{3}$$

$$=-\frac{2}{3}$$

Thus the slope of the line passing through the points is $\boxed{-\frac{2}{3}}$.

The graph is shown below



Answer 25PA.

Consider the points $(-5,4),(-5,-1)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(-5,4)$ and $(x_2,y_2)=(-5,-1)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

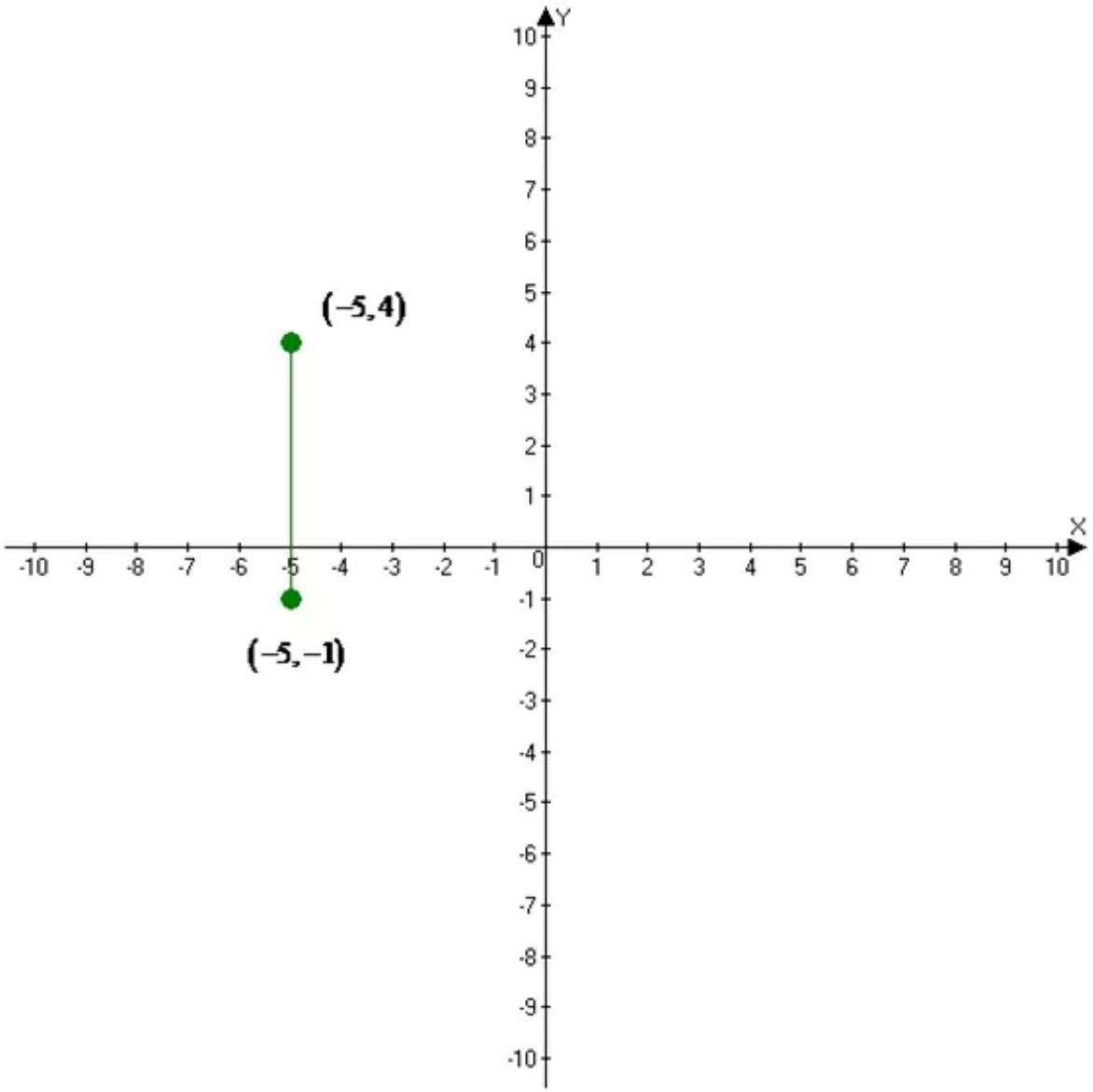
$$=\frac{-1-4}{-5-(-5)} \qquad \text{Substitute}$$

$$=\frac{-5}{0}$$

Undefined

Thus the slope of the line passing through the points is $\boxed{\text{Undefined}}$.

The graph is shown below



Answer 26PA.

Consider the points $(2,6),(-1,3)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(2,6)$ and $(x_2,y_2)=(-1,3)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

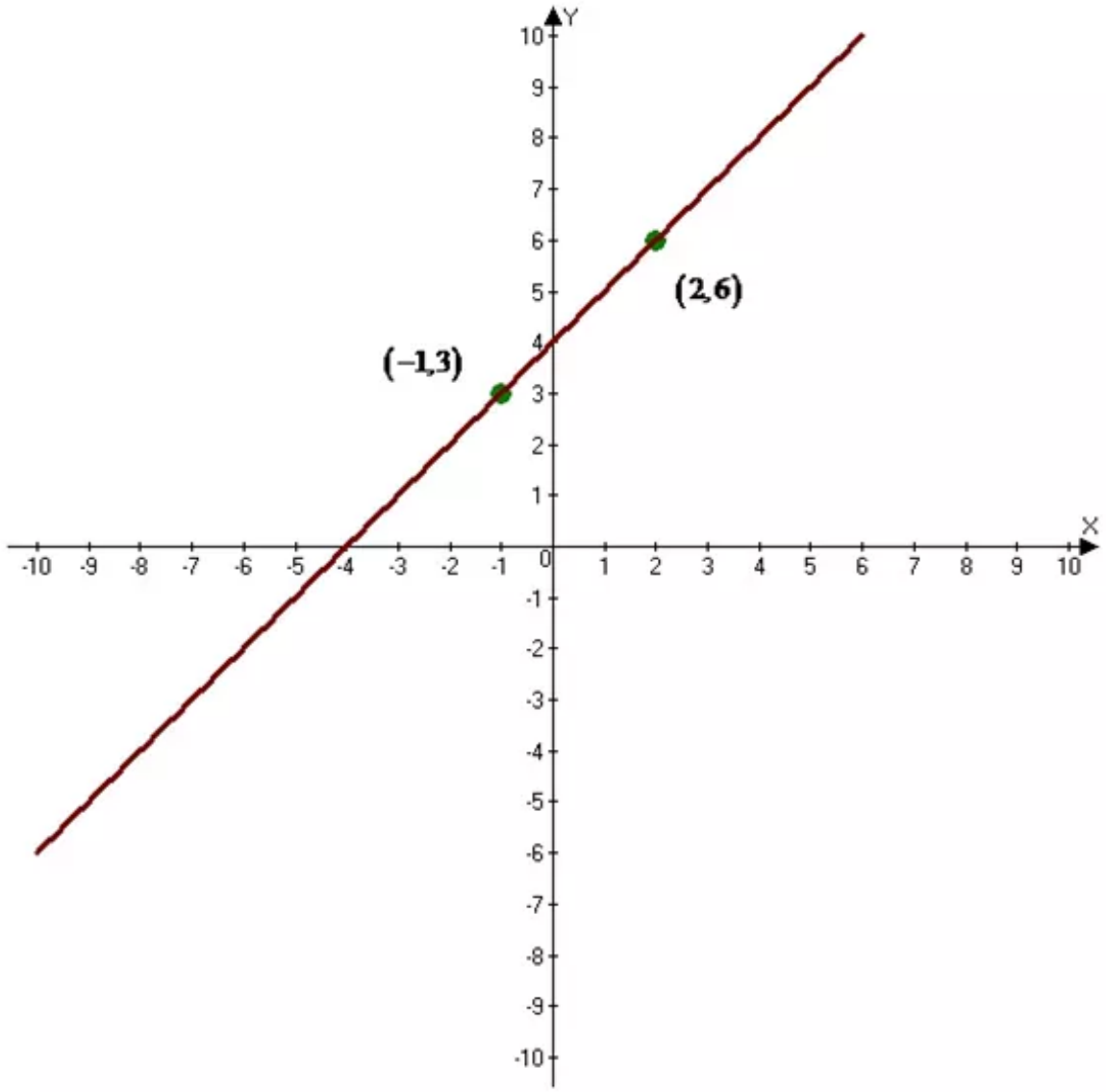
$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$
$$=\frac{3-6}{-1-2} \qquad \text{Substitute}$$
$$=\frac{-3}{-3}$$
$$=1$$

Thus the slope of the line passing through the points is $\boxed{1}$.

The graph is shown below



Answer 27PA.

Consider the points $(-2,3),(8,3)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(-2,3)$ and $(x_2,y_2)=(8,3)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

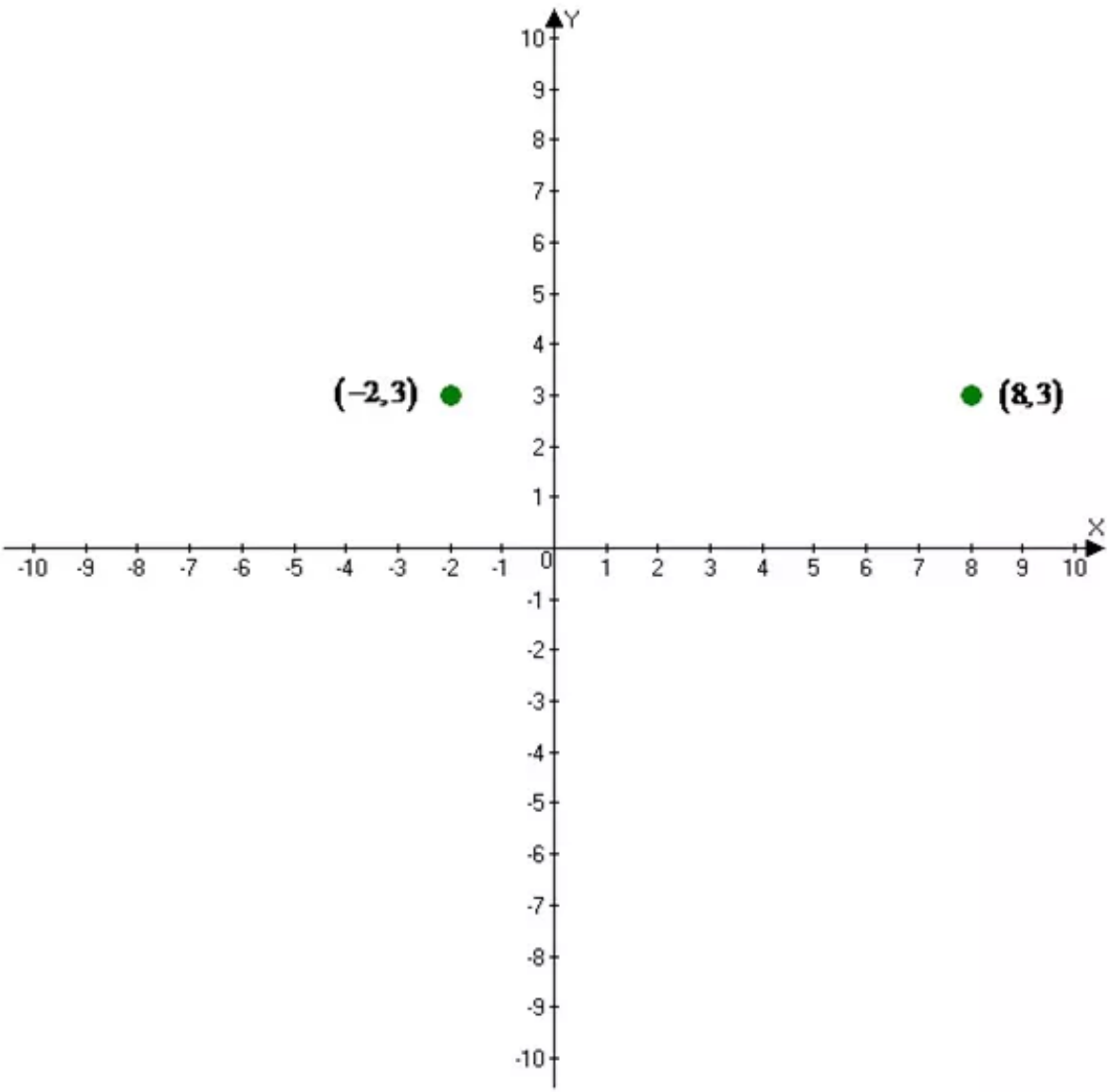
$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$\begin{aligned} m&=\frac{y_2-y_1}{x_2-x_1} && \frac{\text{rise}}{\text{run}}\\ &=\frac{3-3}{8-(-2)} && \text{Substitute}\\ &=\frac{0}{10}\\ &=0 \end{aligned}$$

Thus the slope of the line passing through the points is $\boxed{0}$.

The graph is shown below



Answer 28PA.

Consider the points $(-3,9),(-7,6)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(-3,9)$ and $(x_2,y_2)=(-7,6)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

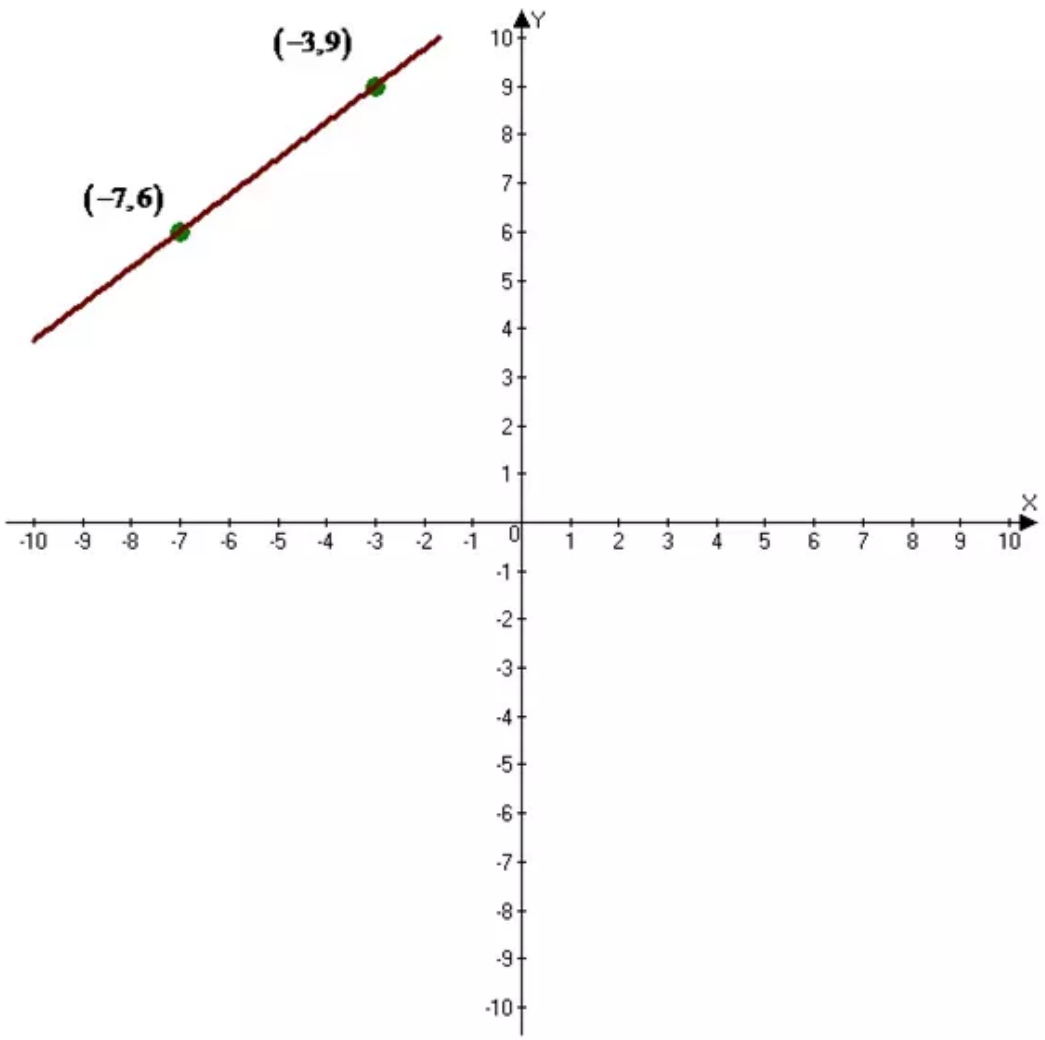
$$=\frac{6-9}{-7-(-3)} \qquad \text{Substitute}$$

$$=\frac{-3}{-4}$$

$$=\frac{3}{4}$$

Thus the slope of the line passing through the points is $\boxed{\frac{3}{4}}$.

The graph is shown below



Answer 29PA.

Consider the points $(-8,3),(-6,2)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(-8,3)$ and $(x_2,y_2)=(-6,2)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

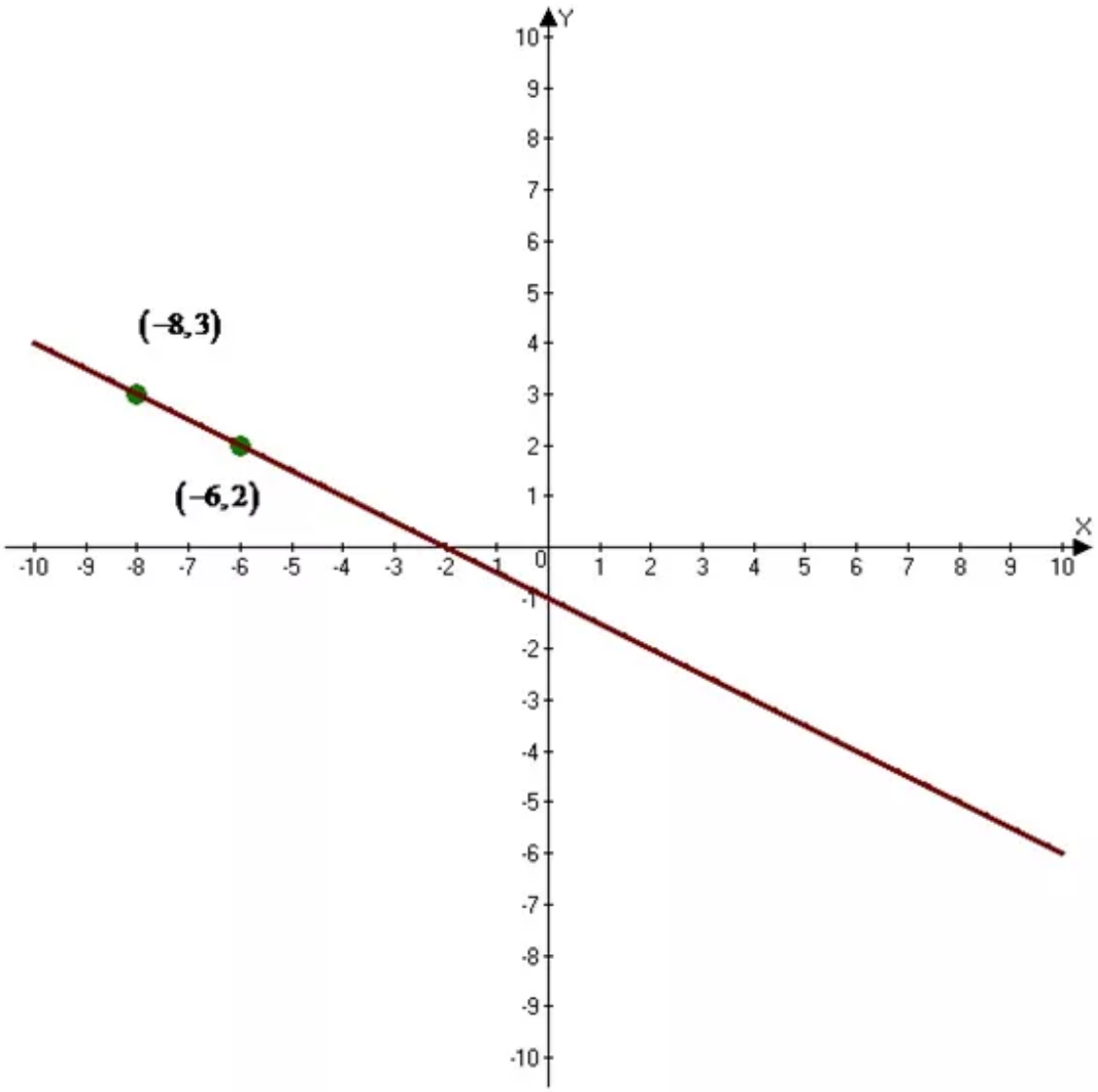
$$=\frac{2-3}{-6-(-8)} \qquad \text{Substitute}$$

$$=\frac{-1}{2}$$

$$=-\frac{1}{2}$$

Thus the slope of the line passing through the points is $\boxed{-\frac{1}{2}}$.

The graph is shown below



Answer 30PA.

Consider the points $(-2,0),(1,-1)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(-2,0)$ and $(x_2,y_2)=(1,-1)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

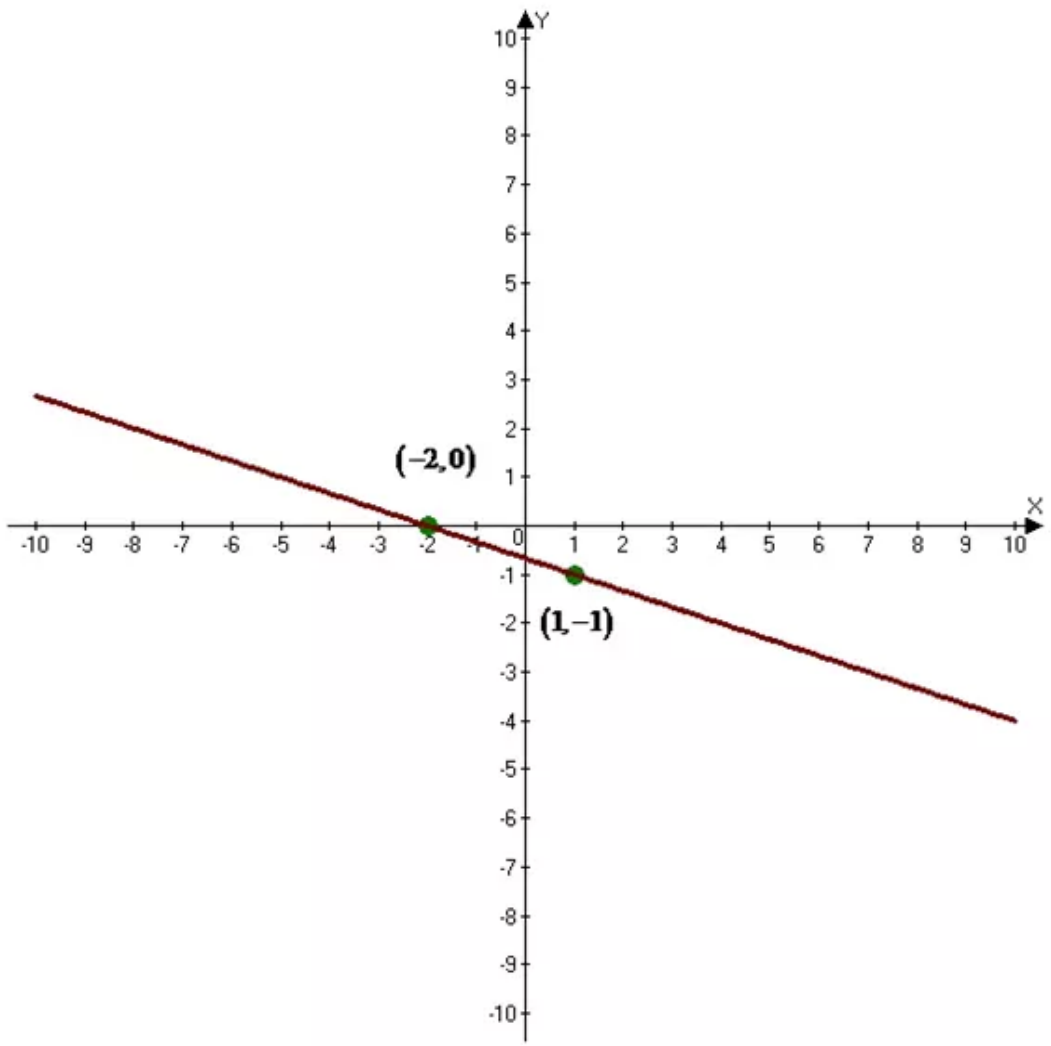
$$=\frac{-1-0}{1-(-2)} \qquad \text{Substitute}$$

$$=\frac{-1}{3}$$

$$=-\frac{1}{3}$$

Thus the slope of the line passing through the points is $\boxed{-\frac{1}{3}}$.

The graph is shown below



Answer 31PA.

Consider the points $(4.5,-1),(5.3,2)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(4.5,-1)$ and $(x_2,y_2)=(5.3,2)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

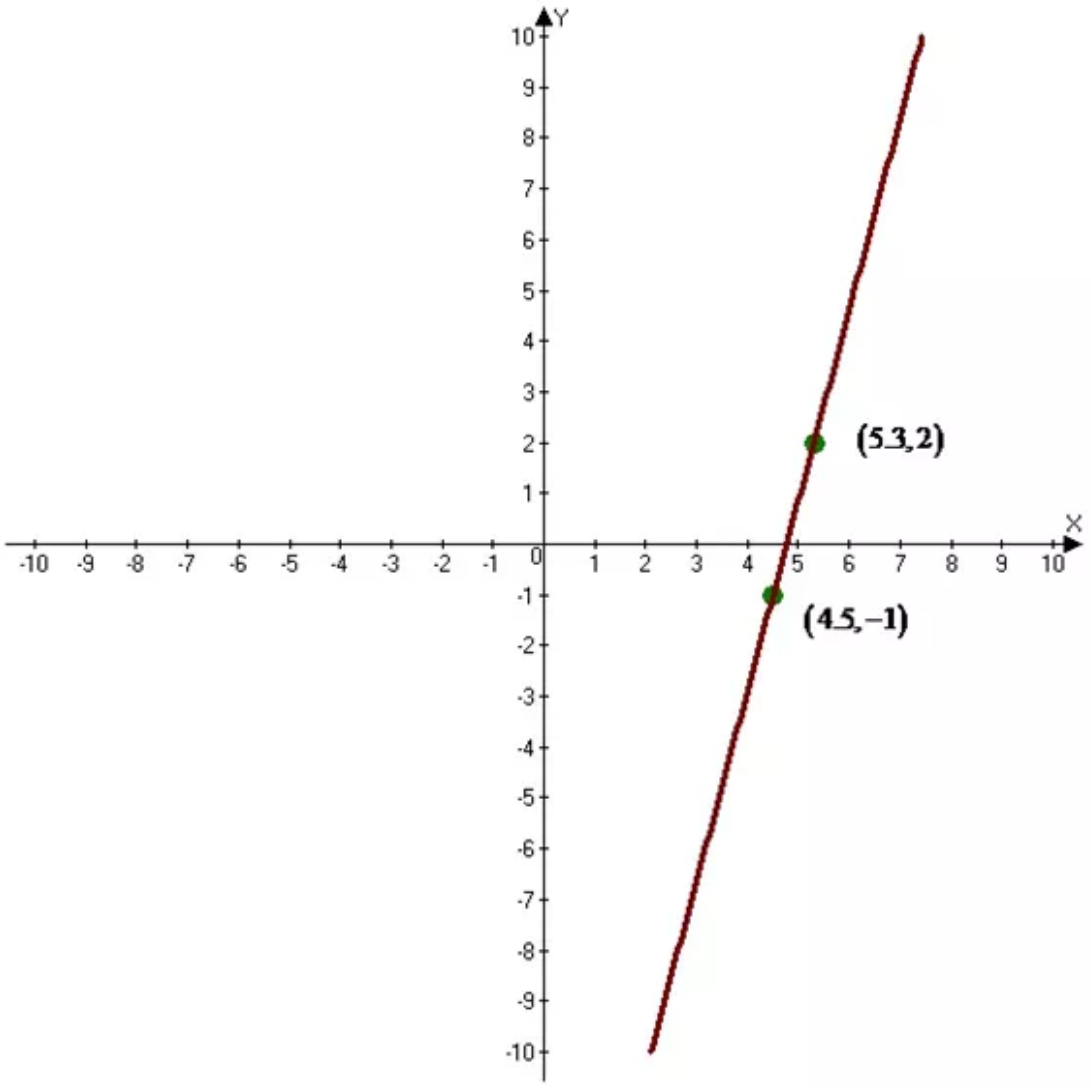
$$=\frac{2-(-1)}{5.3-4.5} \qquad \text{Substitute}$$

$$=\frac{3}{0.8}$$

$$=3.75$$

Thus the slope of the line passing through the points is $\boxed{3.75}$.

The graph is shown below



Answer 32PA.

Consider the points $(0.75,1),(0.75,-1)$

Need to find the slope of the line that passes through each pair of points

Let $(x_1,y_1)=(0.75,1)$ and $(x_2,y_2)=(0.75,-1)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2)

$$m=\frac{y_2-y_1}{x_2-x_1}$$

Substituting the values

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \frac{\text{rise}}{\text{run}}$$

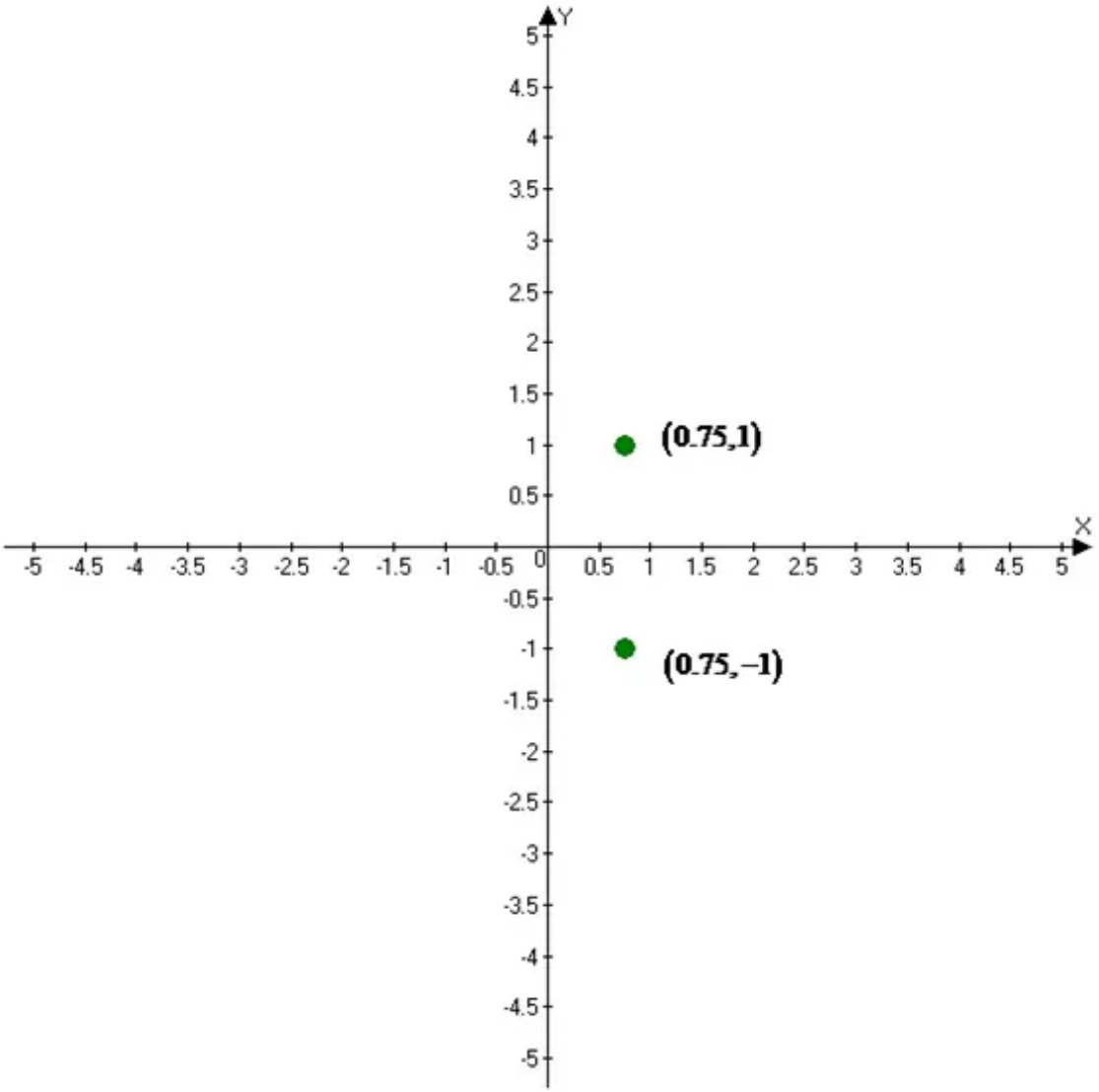
$$=\frac{-1-1}{0.75-0.75} \qquad \text{Substitute}$$

$$=\frac{-2}{0}$$

$$=\text{Undefined}$$

Thus the slope of the line passing through the points is $\boxed{\text{Undefined}}$.

The graph is shown below



Answer 33PA.

Consider the pair of points $\left(2\frac{1}{2},-1\frac{1}{2}\right)$ and $\left(-\frac{1}{2},\frac{1}{2}\right)$

Need to find the slope of the line passing through the points

Pair of points can be simplified or can be written as

$\left(2\frac{1}{2},-1\frac{1}{2}\right)=\left(\frac{5}{2},-\frac{3}{2}\right)$ and the second is $\left(-\frac{1}{2},\frac{1}{2}\right)$

Let us take $(x_1,y_1)=\left(\frac{5}{2},-\frac{3}{2}\right)$ and $(x_2,y_2)=\left(-\frac{1}{2},\frac{1}{2}\right)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2) is given by

$$m=\frac{y_2-y_1}{x_2-x_1}$$ Slope formulae

$$=\frac{\frac{1}{2}-\left(-\frac{3}{2}\right)}{-\frac{1}{2}-\frac{5}{2}}$$ Replacing the values

$$=\frac{\frac{1}{2}+\frac{3}{2}}{-\frac{1}{2}-\frac{5}{2}}$$ Simplify

$$=\frac{\frac{4}{2}}{-\frac{6}{2}}$$

This can be written as

$$\frac{\frac{4}{2}}{-\frac{6}{2}}=\frac{4}{2}\left(-\frac{2}{6}\right)$$ Simplify

$$=-\frac{4}{6}$$ (Cancelling 2 both in the numerator and in the denominator)

$$=-\frac{2}{3}$$

Thus the slope of the line passing through the points is given by $\boxed{-\frac{2}{3}}$.

Answer 34PA.

Consider the pair of points $\left(\frac{3}{4},1\frac{1}{4}\right)$ and $\left(-\frac{1}{2}-1\right)$

Need to find the slope of the line passing through the points

Pair of points can be simplified or can be written as

$\left(\frac{3}{4},1\frac{1}{4}\right)=\left(\frac{3}{4},\frac{5}{4}\right)$ and the second is $\left(-\frac{1}{2},-1\right)$

Let us take $(x_1,y_1)=\left(\frac{3}{4},\frac{5}{4}\right)$ and $(x_2,y_2)=\left(-\frac{1}{2},-1\right)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2) is given by

$m=\frac{y_2-y_1}{x_2-x_1}$ Slope formulae

$m=\frac{-1-\frac{5}{4}}{-\frac{1}{2}-\frac{5}{2}}$ Replacing the values

$=\frac{\frac{-4-5}{4}}{\frac{-2-3}{4}}$ Simplify

$=\frac{-\frac{9}{4}}{-\frac{5}{4}}$

This can be written as

$\frac{-\frac{9}{4}}{-\frac{5}{4}}=-\frac{9}{4}\times-\frac{4}{5}$ Simplify

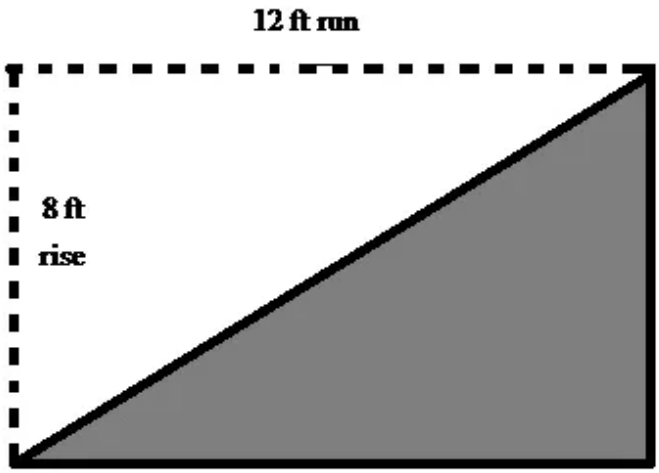
$=\frac{-9}{-5}$ (Cancelling 4 both in the numerator and in the denominator)

$=\frac{9}{5}$

Thus the slope of the line passing through the points is given by $\boxed{\frac{9}{5}}$.

Answer 35PA.

Need to estimate the slope of the roof



The slope of a roof describes how steep it is

It is the number of units the roof rises for each unit of run

In the photo the roof rises 8 feet for each 12 feet of run

$$\begin{aligned}\text{Slope} &= \frac{\text{rise}}{\text{run}} \\ &= \frac{8}{11}\end{aligned}$$

This number describes how steep the line is. The greater the absolute value of the slope, the steeper the line.

Slope is the ratio of the change in the y-coordinate (rise) to the change in the x-coordinates (run) as you move from one point to the other

Thus the roof of the slope is $\boxed{\frac{8}{11}}$.

Answer 37PA.

Need to find the slope of the line passes through the origin and (r,s)

Let $(x_1,y_1)=(0,0)$ and $(x_2,y_2)=(r,s)$

Slope of the line passing through the points $(x_1,y_1)=(0,0)$ and $(x_2,y_2)=(r,s)$ is

$$m=\frac{y_2-y_1}{x_2-x_1}$$

By substituting the values we get

$$\begin{aligned}m &= \frac{y_2-y_1}{x_2-x_1} \\ &= \frac{s-0}{r-0} \\ &= \frac{s}{r}\end{aligned}$$

Thus the slope of the line passes through the origin and (r,s) is $\boxed{\frac{s}{r}}$.

Answer 38PA.

Need to find the slope of the line passes through (a,b) and $(a,-b)$

Let $(x_1,y_1)=(a,b)$ and $(x_2,y_2)=(a,-b)$

Slope of the line passing through the points $(x_1,y_1)=(a,b)$ and $(x_2,y_2)=(a,-b)$ is

$$m=\frac{y_2-y_1}{x_2-x_1}$$

By substituting the values we get

$$\begin{aligned} m&=\frac{y_2-y_1}{x_2-x_1}\\ &=\frac{-b-b}{a-a}\\ &=\frac{-2b}{0}\\ &\text{Undefined}\end{aligned}$$

Thus the slope of the line passes through the (a,b) and $(a,-b)$ is $\boxed{\text{Undefined}}$

Since the division by zero is undefined, the slope is undefined.

Answer 39PA.

Need to find the slope of the ladder as a positive number with a height of 16 feet and the bottom is placed 4 feet

Here the roof rises 16 feet for each 4 feet of run

Slope can be calculated by

$$\text{Slope}=\frac{\text{Rise}}{\text{Run}}$$

Substituting the values we get

$$\begin{aligned}\text{Slope}&=\frac{16}{4}\\ &=4\end{aligned}$$

Hence the slope of the ladder is $\boxed{4 \text{ feet}}$.

Answer 40PA.

Need to find the annual rate of change in the federal minimum wage rate from 1991 to 1997

Use the formulae for the slope

$$\frac{\text{rise}}{\text{run}}=\frac{\text{Change in wage}}{\text{Change in time}}$$

In 1991 the federal minimum wage rate was $\$4.25$ and in 1997 it was increased to $\$5.15$

Let $(x_1,y_1)=(1991,4.25)$ and $(x_2,y_2)=(1997,5.15)$

Substituting the values we get

$$\begin{aligned}1997-1991&=\frac{\text{Change in wage}}{\text{Change in time}}\\&=\frac{5.15-4.25}{1997-1991}\\&=\frac{0.9}{6}\\&=0.15\end{aligned}$$

Over this 6-year period, the federal minimum wage increased by $\boxed{\$0.15}$ per hour, for a rate of change of $\$0.15$ per hour.

Answer 41PA.

Consider the points $(6,2),(9,r),m=-1$

Need to find the value of r so the line that passes through each pair of points has the slope

Let $(x_1,y_1)=(6,2)$ and $(x_2,y_2)=(9,r)$ and $m=-1$

Slope of the line passing through the points is $m=\frac{y_2-y_1}{x_2-x_1}$

$$\begin{aligned}m&=\frac{y_2-y_1}{x_2-x_1} && \text{Slope formuale}\\-1&=\frac{r-2}{9-6} && \text{Substitute}\\-1&=\frac{r-2}{3} && \text{Subtract}\\-1(3)&=r-2 && \text{Find the cross products}\end{aligned}$$

By simplification we get

$$\begin{aligned}r-2&=-3\\r-2+2&=-3+2 && \text{Adding 2 on both sides}\\r+0&=-1 && \text{Combine like terms}\\r&=-1\end{aligned}$$

Thus the value of r is $\boxed{-1}$.

Answer 42PA.

Consider the points $(4,-5),(3,r),m=8$

Need to find the value of r so the line that passes through each pair of points has the slope

Let $(x_1,y_1)=(4,-5)$ and $(x_2,y_2)=(3,r)$ and $m=8$

Slope of the line passing through the points is $m=\frac{y_2-y_1}{x_2-x_1}$

$$m=\frac{y_2-y_1}{x_2-x_1}$$ Slope formuale

$$8=\frac{r-(-5)}{3-4}$$ Substitute

$$8=\frac{r+5}{-1}$$ Subtract

$$8(-1)=r+5$$ Find the cross products

By simplification we get

$$r+5=-8$$

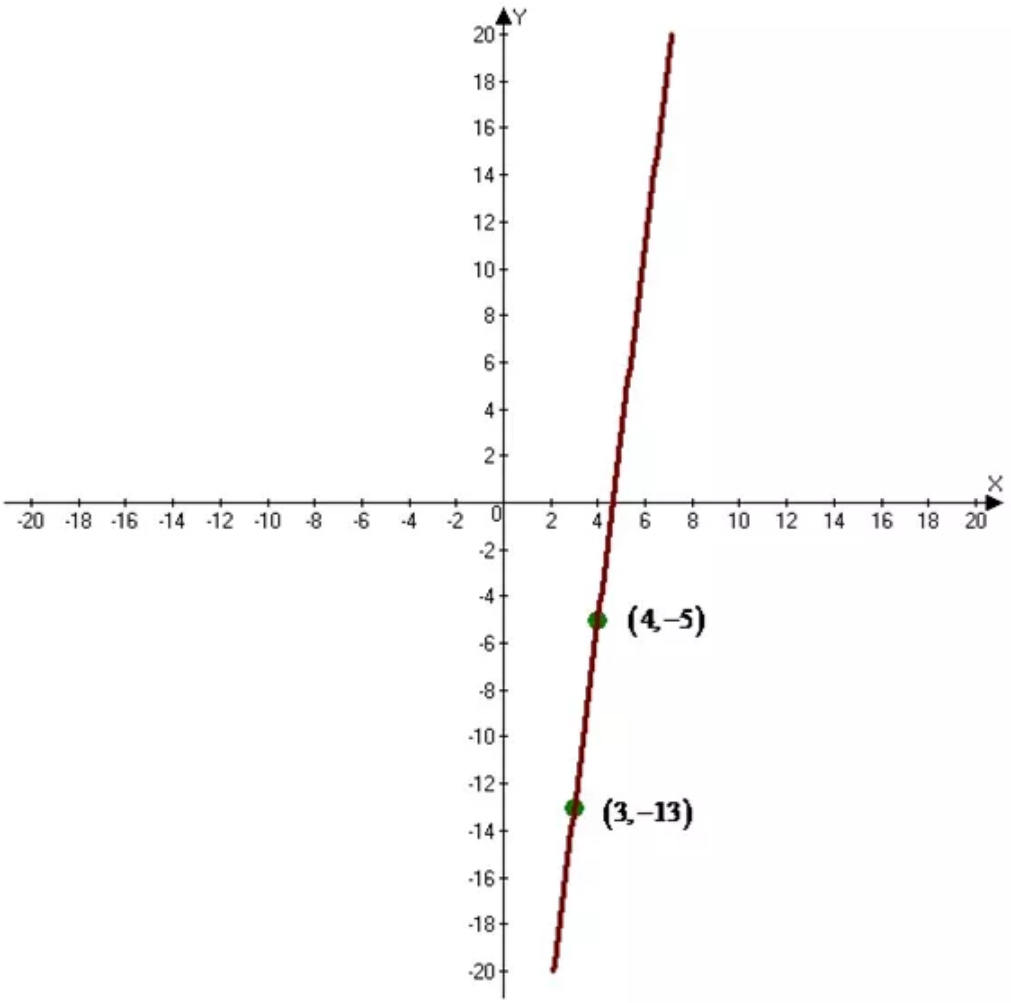
$$r+5-5=-8-5$$ Adding -5 on both sides

$$r+0=-13$$ Combine like terms

$$r=-13$$

Thus the value of r is $\boxed{-13}$.

The graph is shown below



Answer 43PA.

Consider the points $(5,r),(2,-3),m=\frac{4}{3}$

Need to find the value of r so the line that passes through each pair of points has the slope

Let $(x_1,y_1)=(5,r)$ and $(x_2,y_2)=(2,-3)$ and $m=\frac{4}{3}$

Slope of the line passing through the points is $m=\frac{y_2-y_1}{x_2-x_1}$

$$m=\frac{y_2-y_1}{x_2-x_1}$$ Slope formuale

$$\frac{4}{3}=\frac{-3-r}{2-5}$$ Substitute

$$\frac{4}{3}=\frac{-3-r}{-3}$$ Subtract

$$4(-3)=3(-3-r)$$ Find the cross products

By simplification we get

$$-3r-9=-12$$

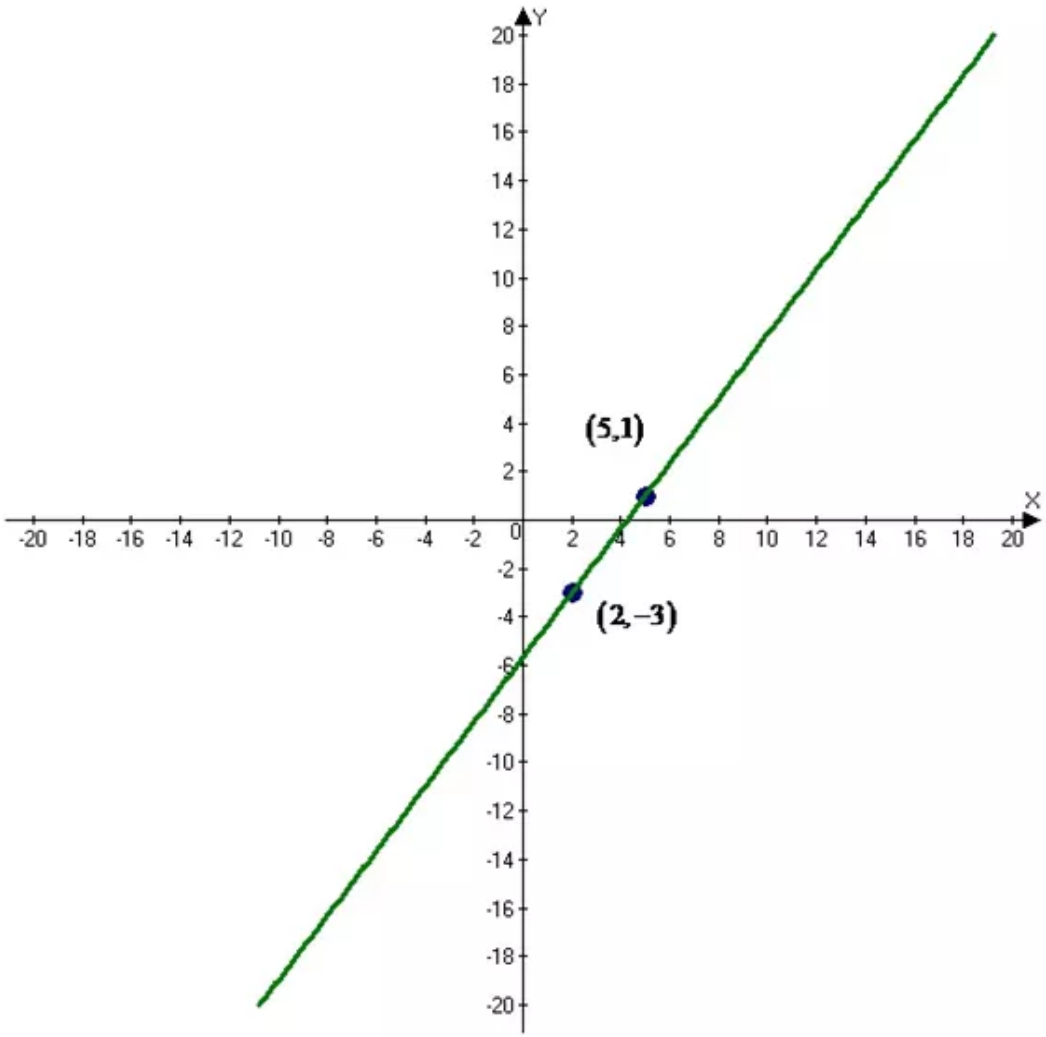
$$-3r-9+9=-12+9$$ Adding 9 on both sides

$$-3r=-3$$ Combine like terms

$$r=1$$ Dividing both sides by -3

Thus the value of r is $\boxed{1}$.

The graph is shown below



Answer 44PA.

Consider the points $(-2,7),(r,3),m=\frac{4}{3}$

Need to find the value of r so the line that passes through each pair of points has the slope

Let $(x_1,y_1)=(-2,7)$ and $(x_2,y_2)=(r,3)$ and $m=\frac{4}{3}$

Slope of the line passing through the points is $m=\frac{y_2-y_1}{x_2-x_1}$

$$m=\frac{y_2-y_1}{x_2-x_1}$$ Slope formuale

$$\frac{4}{3}=\frac{3-7}{r-(-2)}$$ Substitute

$$\frac{4}{3}=\frac{-4}{r+2}$$ Subtract

$$4(r+2)=3(-4)$$ Find the cross products

By simplification we get

$$4r+8=-12$$

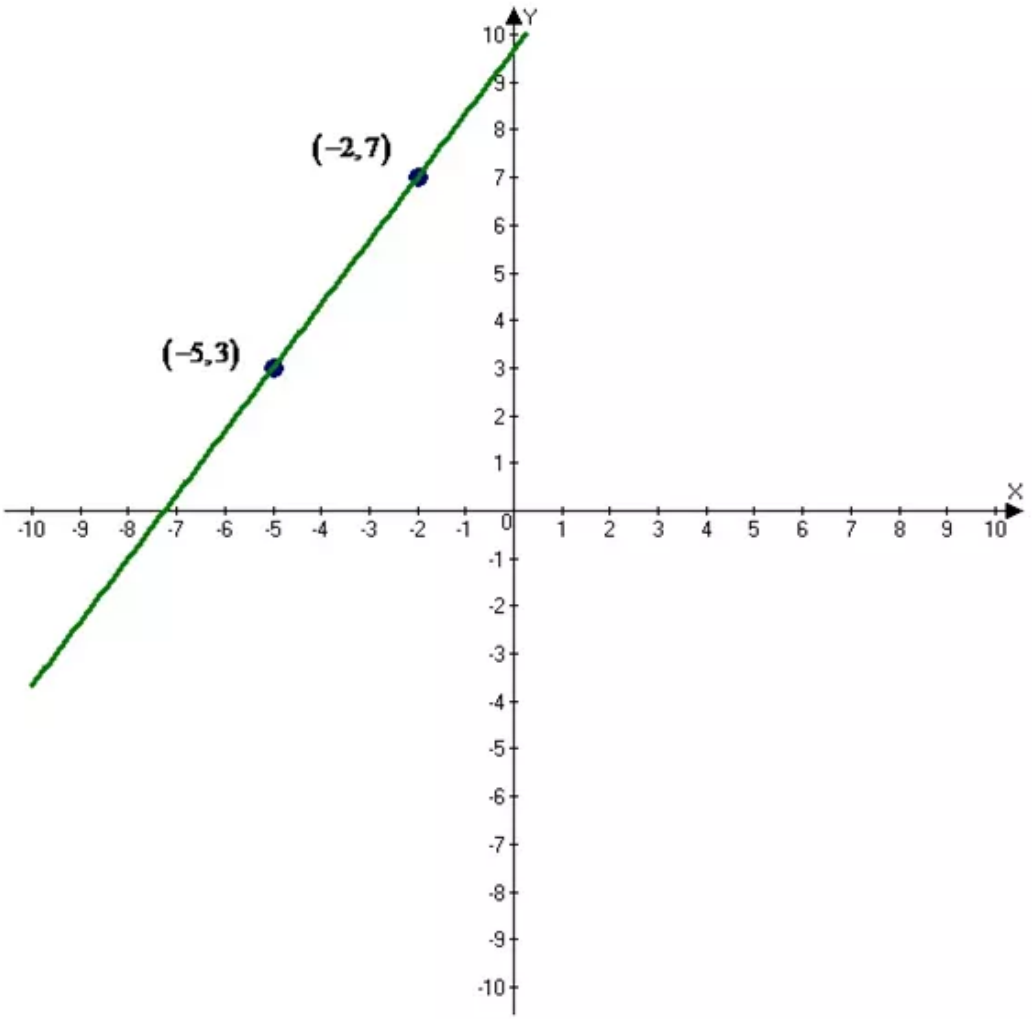
$$4r+8-8=-12-8$$ Adding -8 on both sides

$$4r=-20$$ Combine like terms

$$r=-5$$ Dividing both sides by 4

Thus the value of r is $\boxed{-5}$.

The graph is shown below



Answer 45PA.

Consider the points $\left(\frac{1}{2},-\frac{1}{4}\right),\left(r,-\frac{5}{4}\right),m=4$

Need to find the value of r so the line that passes through each pair of points has the slope

Let $(x_1,y_1)=\left(\frac{1}{2},\frac{1}{4}\right)$ and $(x_2,y_2)=\left(r,-\frac{5}{4}\right)$ and $m=4$

Slope of the line passing through the points is $m=\frac{y_2-y_1}{x_2-x_1}$

$$m=\frac{y_2-y_1}{x_2-x_1}$$ Slope formuale

$$4=\frac{-\frac{5}{4}+\frac{1}{4}}{r-\frac{1}{2}}$$ Substitute

$$4=\frac{-1}{r-\frac{1}{2}}$$ Subtract

$$4\left(r-\frac{1}{2}\right)=(-1)$$ Find the cross products

By simplification we get

$$4r-2=-1$$

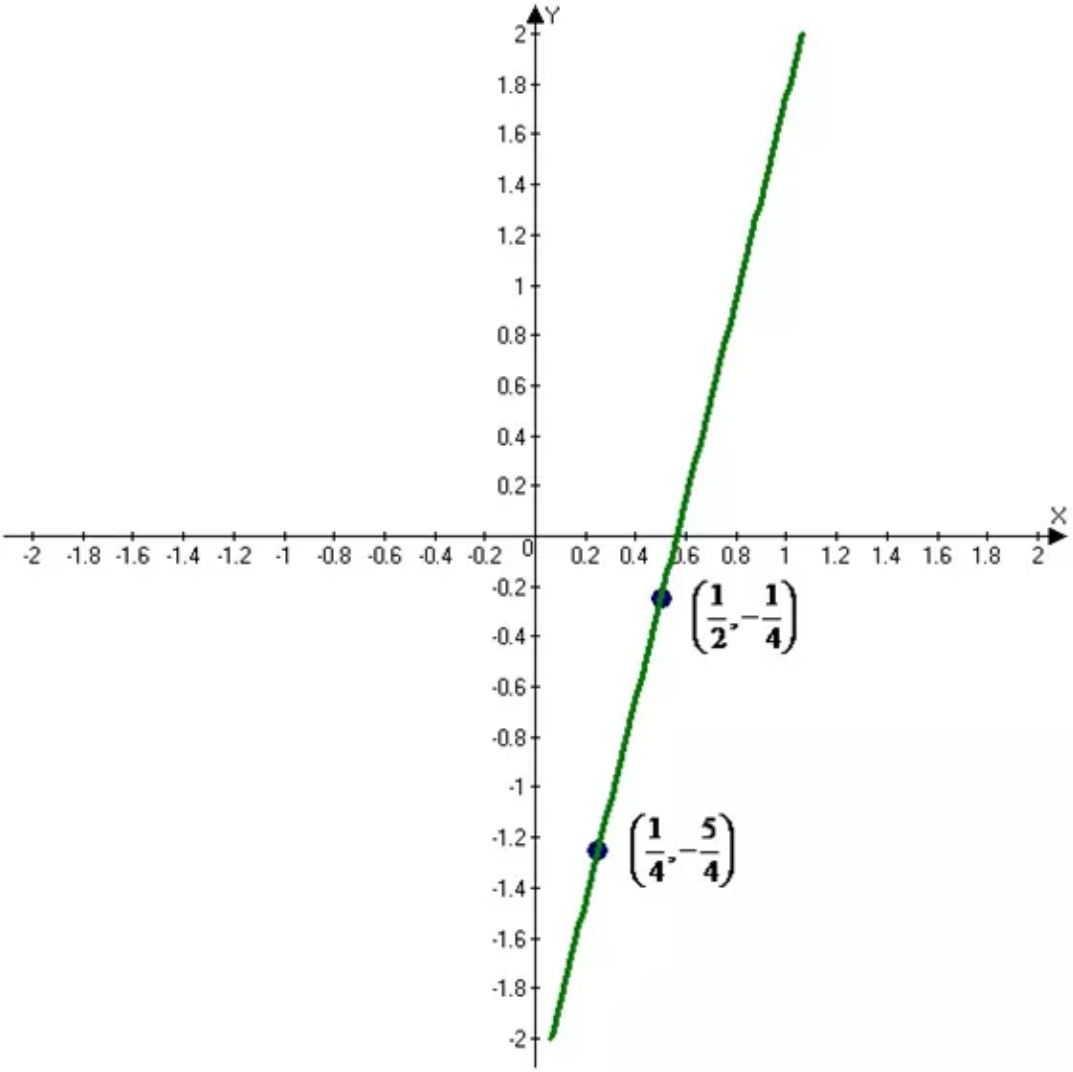
$$4r-2+2=-1+2$$ Adding 2 on both sides

$$4r=1$$ Combine like terms

$$r=\frac{1}{4}$$ Dividing both sides by 4

Thus the value of r is $\boxed{\frac{1}{4}}$.

The graph is shown below



Answer 46PA.

Consider the points $\left(\frac{2}{3},r\right),\left(1,\frac{1}{2}\right),m=\frac{1}{2}$

Need to find the value of r so the line that passes through each pair of points has the slope

Let $(x_1,y_1)=\left(\frac{2}{3},r\right)$ and $(x_2,y_2)=\left(1,\frac{1}{2}\right)$ and $m=\frac{1}{2}$

Slope of the line passing through the points is $m=\frac{y_2-y_1}{x_2-x_1}$

$m=\frac{y_2-y_1}{x_2-x_1}$ Slope formuale

$\frac{1}{2}=\frac{\frac{1}{2}-r}{1-\frac{2}{3}}$ Substitute

$\frac{1}{2}=\frac{\frac{1}{2}-r}{1-\frac{2}{3}}$ Subtract

$\left(1-\frac{2}{3}\right)=2\left(\frac{1}{2}-r\right)$ Find the cross products

By simplification we get

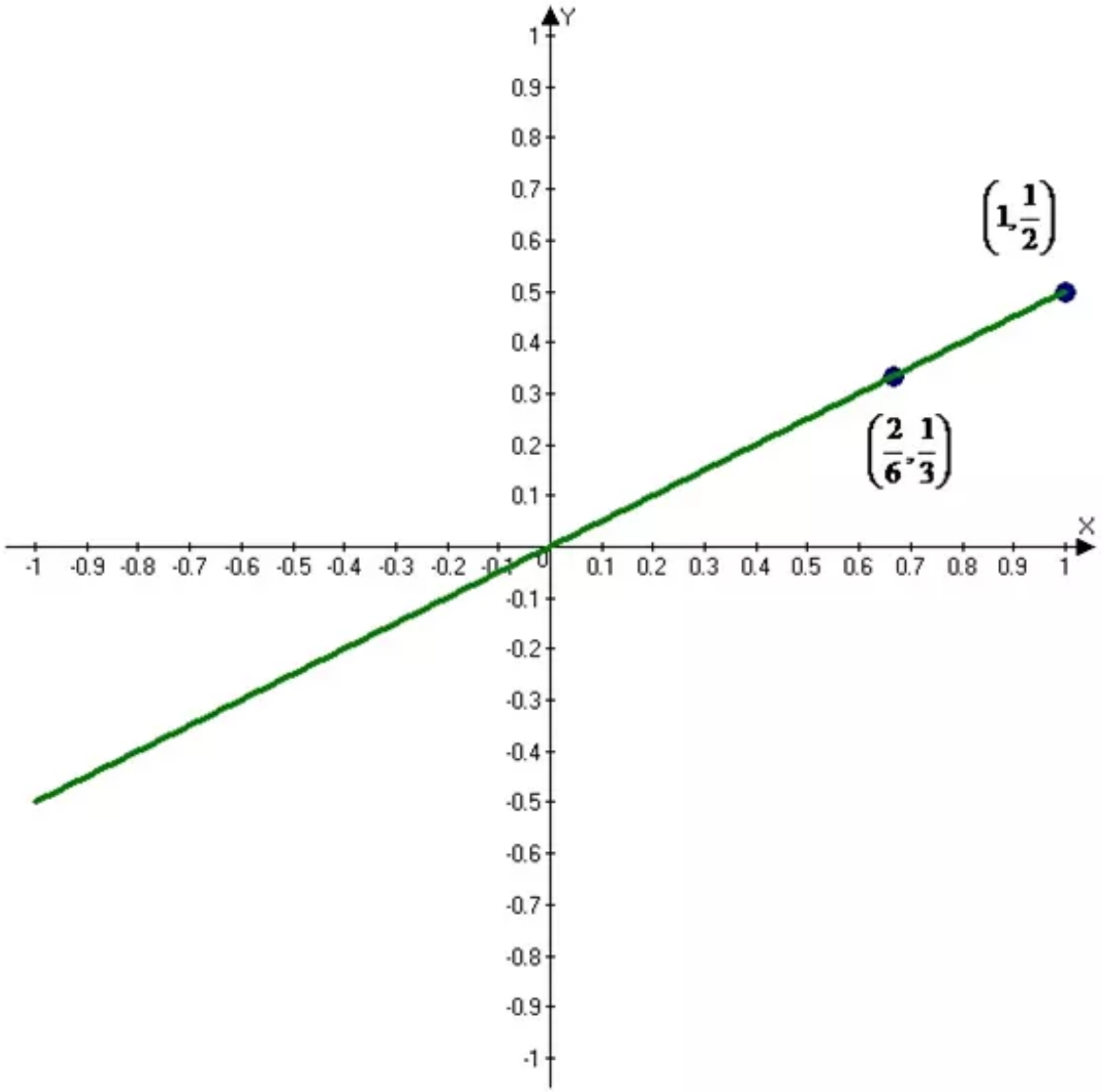
$1-\frac{2}{3}=1-2r$

$-2r=-\frac{2}{3}$ Adding -1 on both sides

$r=\frac{1}{3}$ Dividing both sides by -2

Thus the value of r is $\boxed{\frac{1}{3}}$.

The graph is shown below



Answer 47PA.

Consider the points $(4,r),(r,2),m=-\frac{5}{3}$

Need to find the value of r so the line that passes through each pair of points has the slope

Let $(x_1,y_1)=(4,r)$ and $(x_2,y_2)=(r,2)$ and $m=-\frac{5}{3}$

Slope of the line passing through the points is $m=\frac{y_2-y_1}{x_2-x_1}$

$m=\frac{y_2-y_1}{x_2-x_1}$ Slope formuale

$-\frac{5}{3}=\frac{2-r}{r-4}$ Substitute

$-5(r-4)=3(2-r)$ Find the cross products

$-5r+20=6-3r$

Adding $5r-6$ on both sides

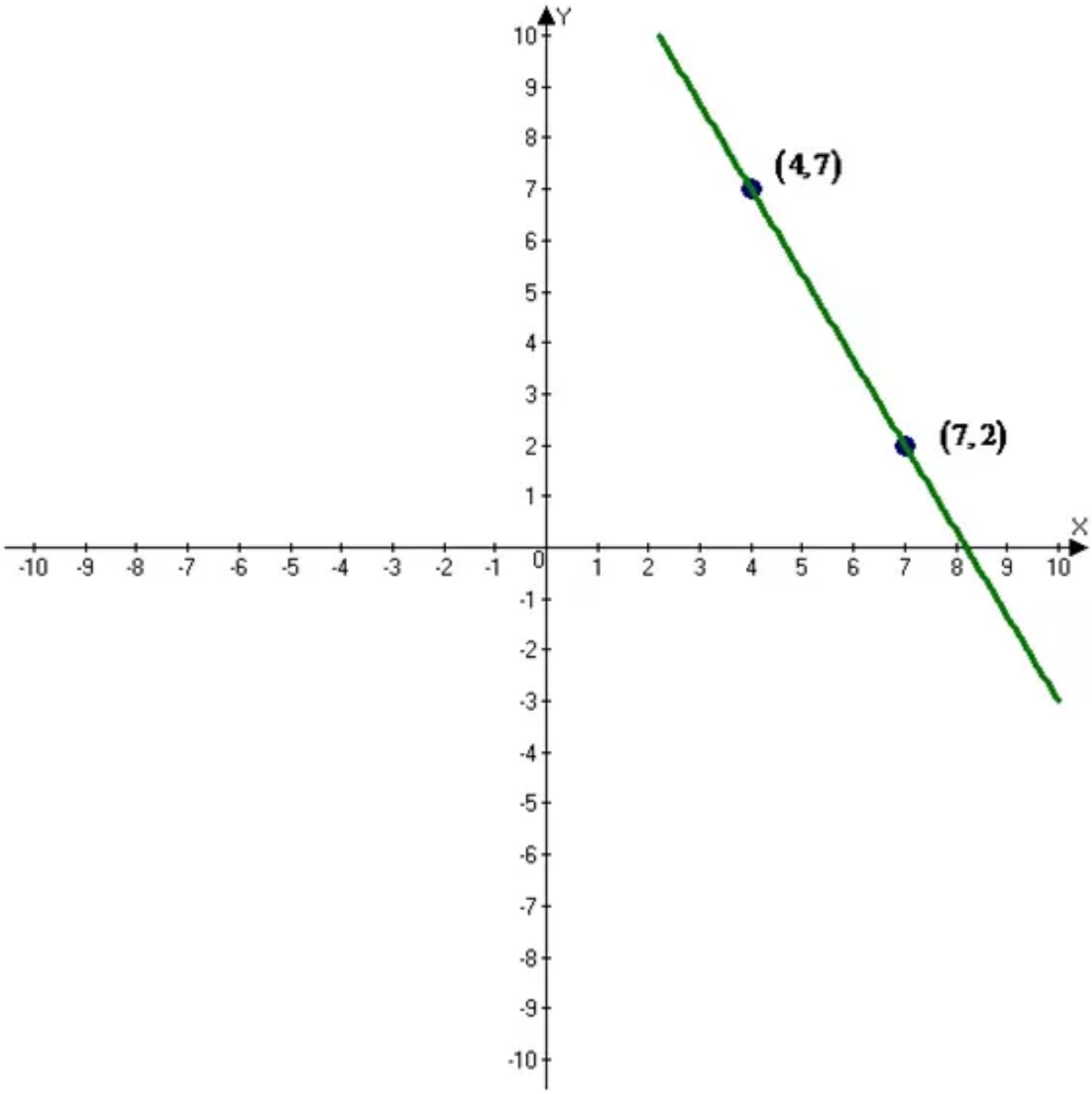
$-5r+20=6-3r$

$2r=14$ Adding $5r-6$ on both sides

$r=7$ Dividing both sides by 2

Thus the value of r is $\boxed{7}$.

The graph is shown below



Answer 48PA.

Consider the points $(r,5),(-2,r),m=-\frac{2}{9}$

Need to find the value of r so the line that passes through each pair of points has the slope

Let $(x_1,y_1)=(r,5)$ and $(x_2,y_2)=(-2,r)$ and $m=-\frac{2}{9}$

Slope of the line passing through the points is $m=\frac{y_2-y_1}{x_2-x_1}$

$$m=\frac{y_2-y_1}{x_2-x_1}$$ Slope formuale

$$-\frac{2}{9}=\frac{r-5}{-2-r}$$ Substitute

$$-2(-2-r)=9(r-5)$$ Find the cross products

$$4+2r=9r-45$$

Adding $45-2r$ on both sides

$$4+2r=9r-45$$

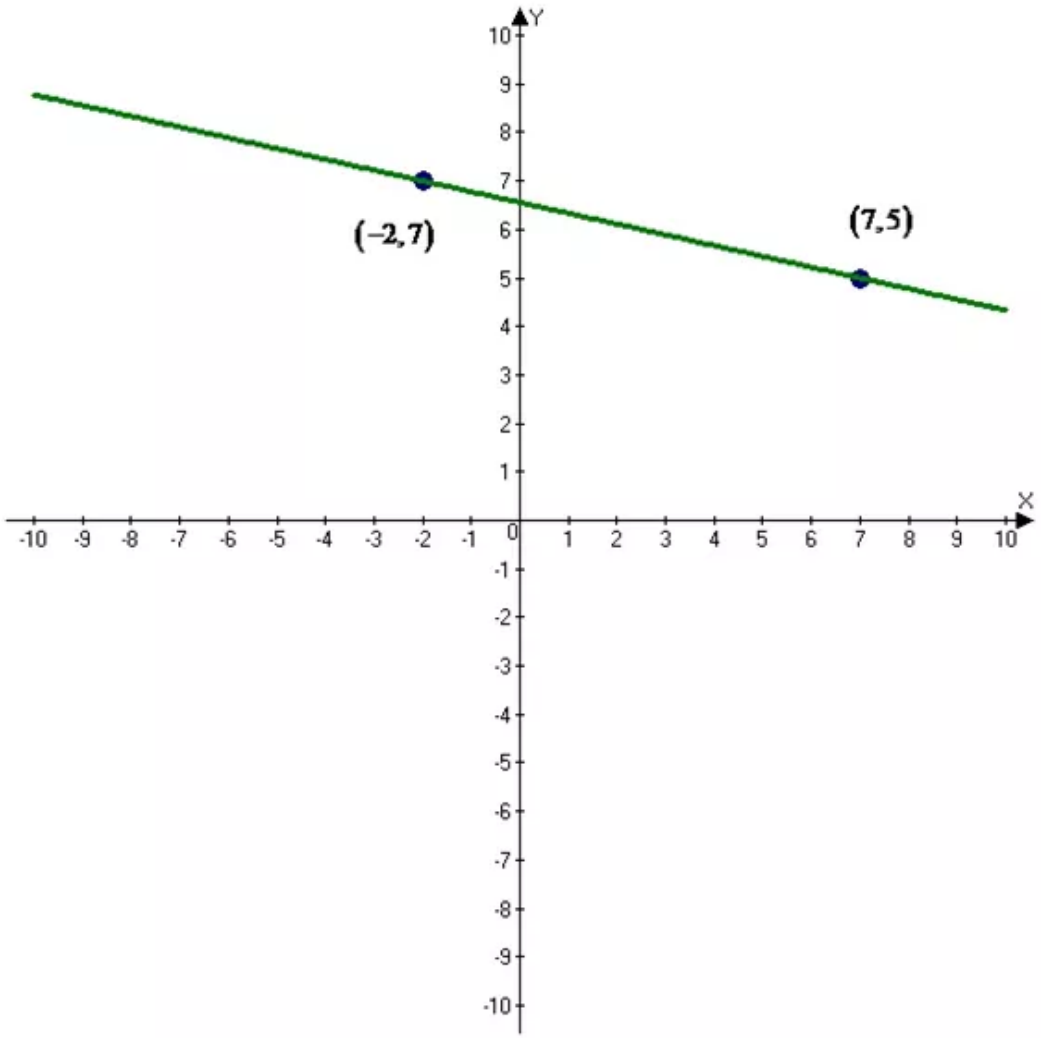
$$9r-2r=45+4$$ Adding $-2r+45$ on both sides

$$7r=49$$ Combine like terms

$$r=7$$ Dividing both sides by 7

Thus the value of r is $\boxed{7}$.

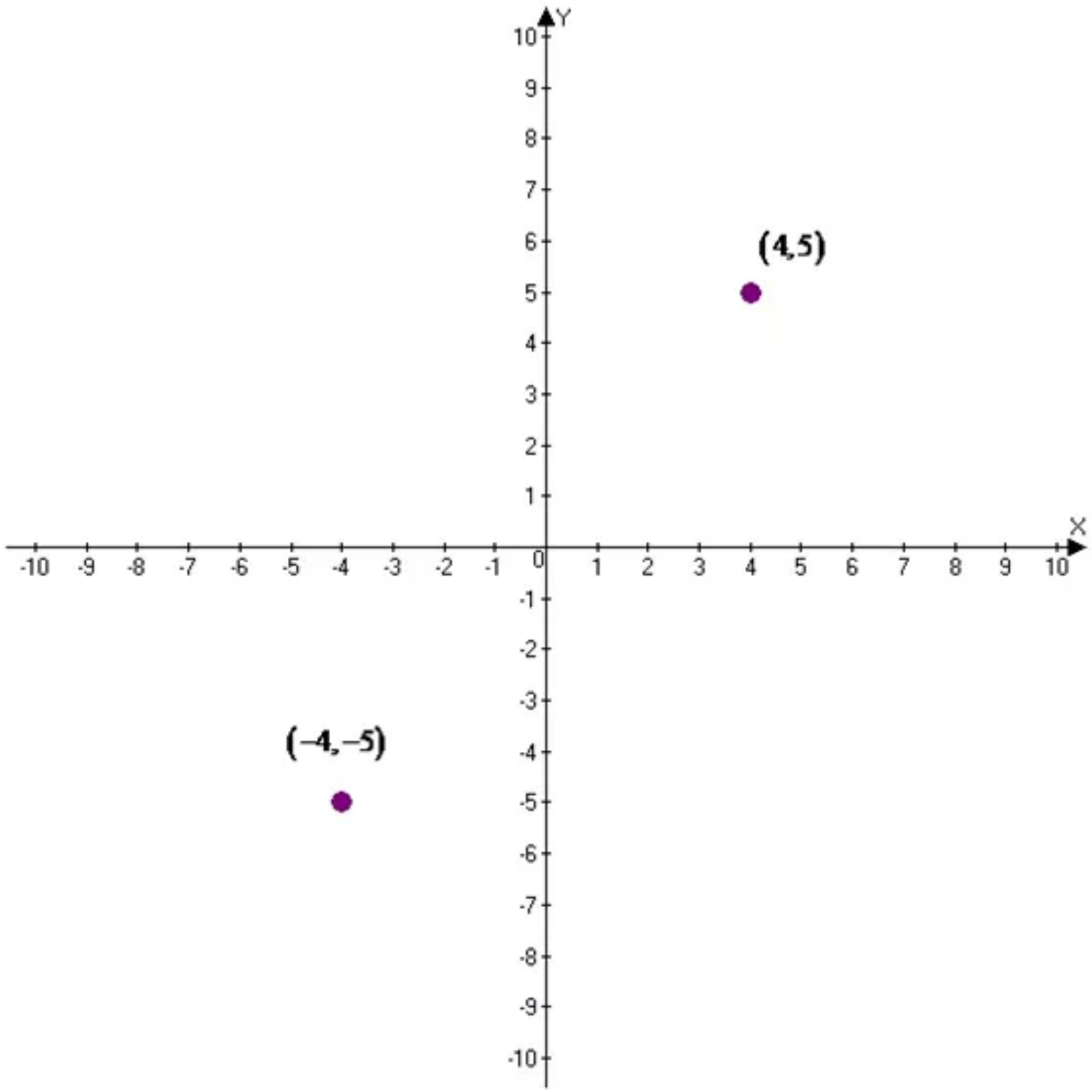
The graph is shown below



Answer 49PA.

Need to explain that how you know that the slope of the line through $(-4,-5)$ and $(4,5)$ is positive without calculating

First mark the given points in the graph and the graph is shown below



By basing above graph we can say that the point $(4,5)$ lie in the first quadrant because both the values are positive

And the point $(-4,-5)$ lies in the third quadrant because here both the values x and y v lie in the third quadrant

Any straight line joining two points from first quadrant and the third quadrant has a positive slope.

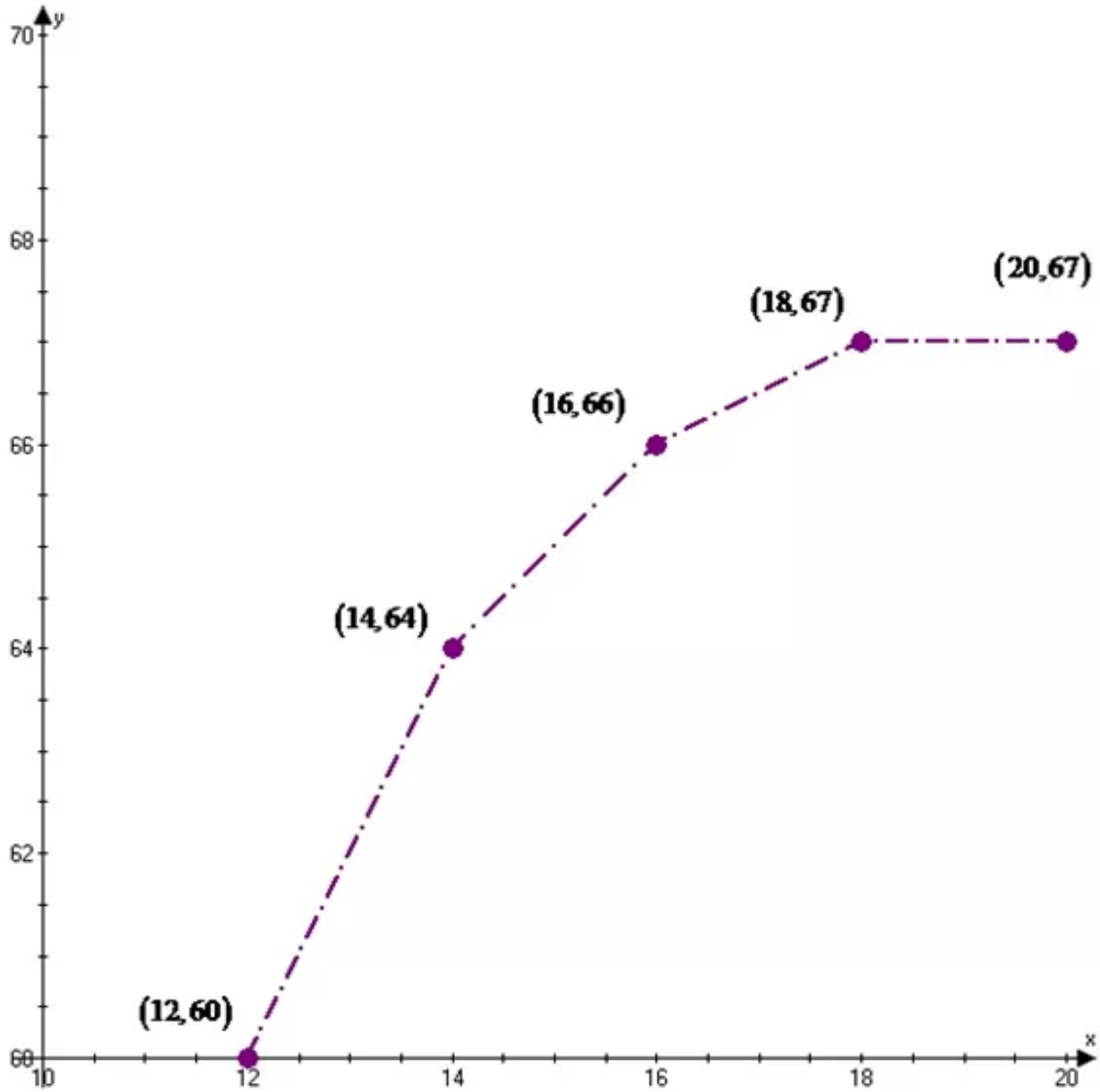
Answer 50PA.

Consider the table

Age (years)	12	14	16	18	20
Height (inches)	60	64	66	67	67

Need to find a broken line graph for the data

The broken line graph for the given data is shown below



Hence the required broken line graph is drawn.

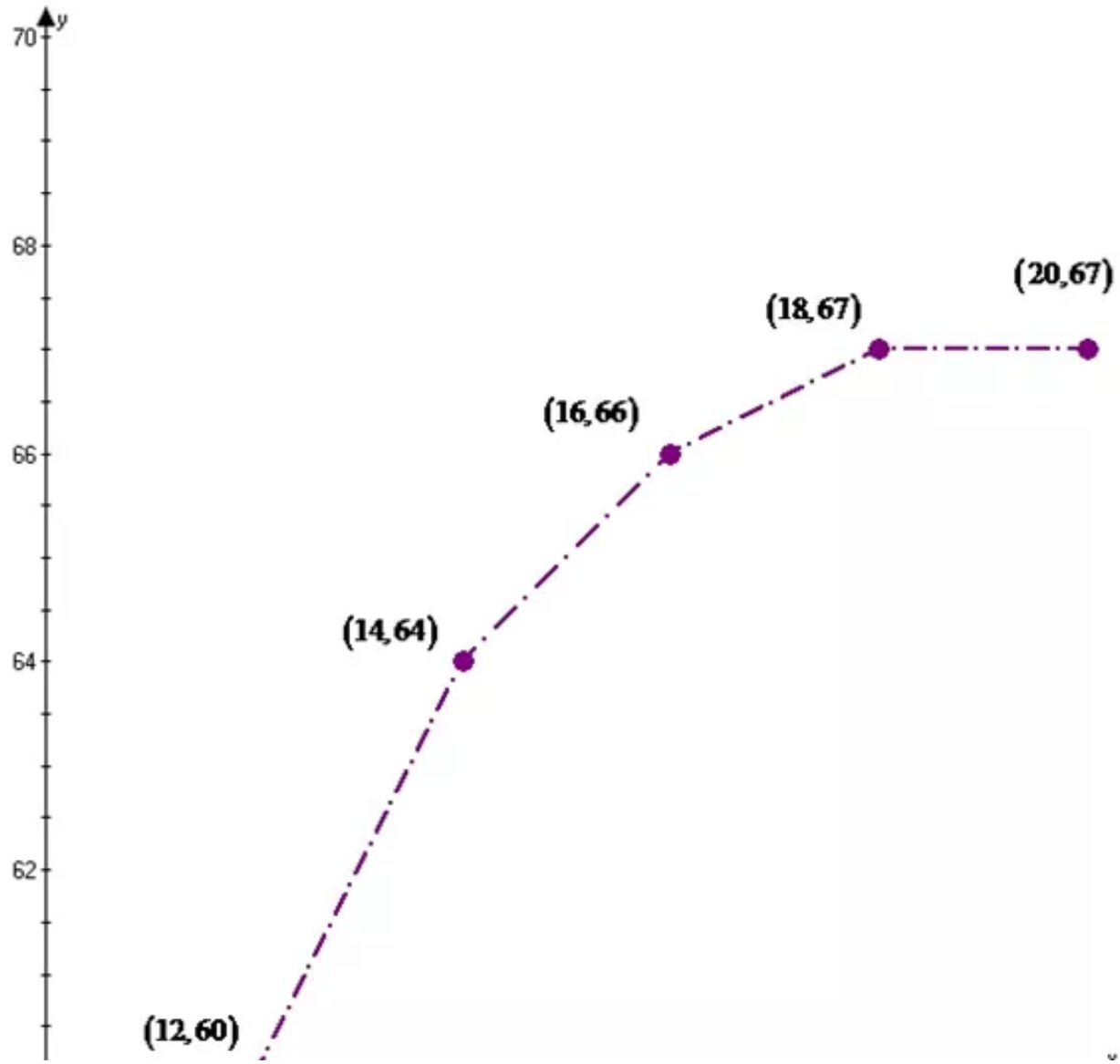
Answer 51PA.

Consider the table

Age (years)	12	14	16	18	20
Height (inches)	60	64	66	67	67

Need to determine the two-year period when Karen grew the fastest by using the graph and explain your reasoning

The broken line graph for the given data is shown below

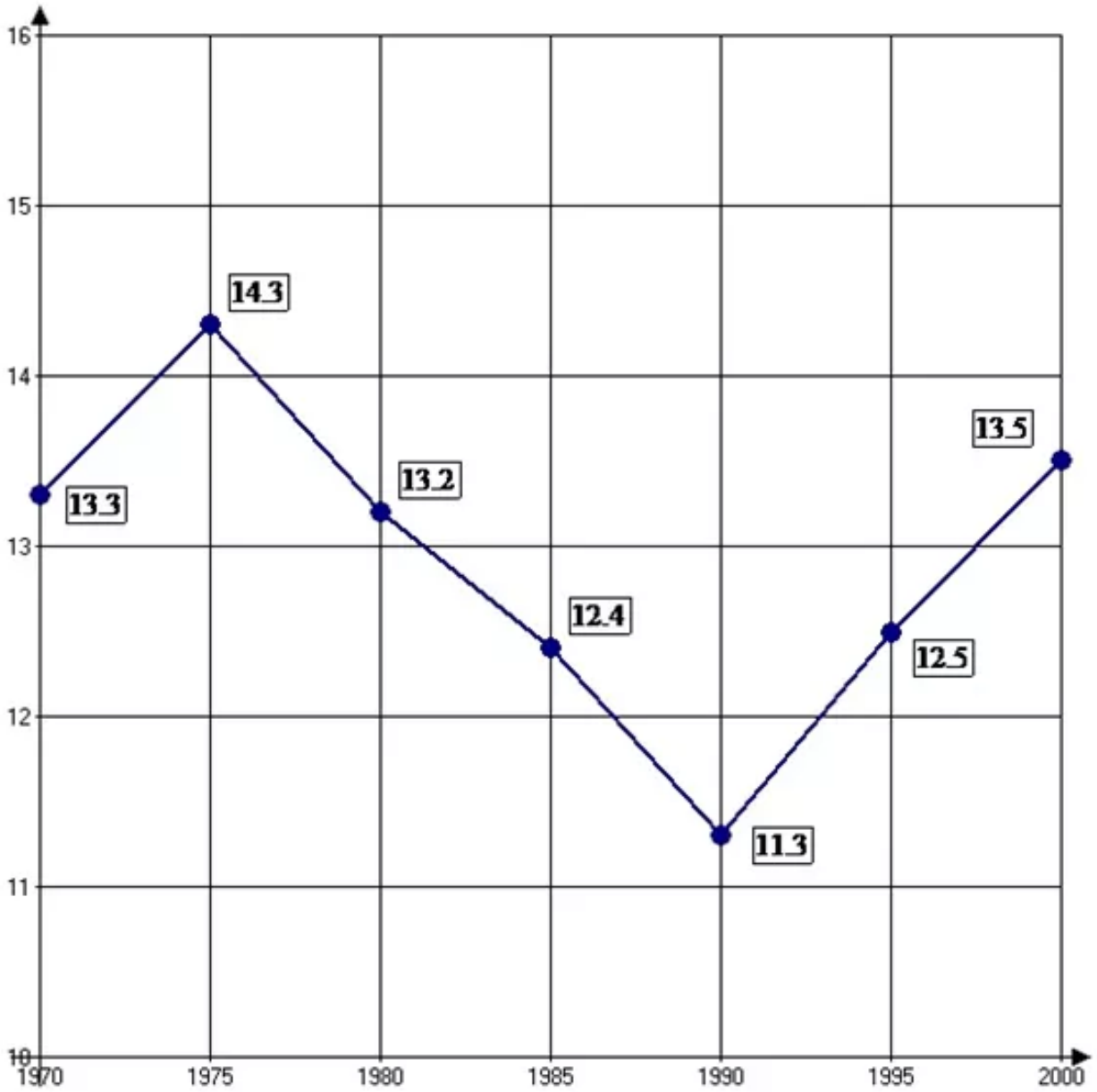


From the graph that the two year period when Karen grew the fastest is $12\text{-}14$, the steepest part of the graph

Hence the two-year period when Karen grew the fastest is $\boxed{12\text{-}14}$.

Answer 53PA.

Consider the graph



Need to find the when was the rate of change the greatest and when was the rate of change the least

First finding the rate of change from 1970-1975

First finding the rate of change from 1970-1975

Let us take $(x_1, y_1) = (1970, 13.3)$ and $(x_2, y_2) = (1975, 14.3)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{14.3 - 13.3}{5} \qquad \text{Replacing the values}$$

$$= \frac{1}{5}$$

$$= 0.2$$

Thus the rate of change for the period 1970-1975 is $\boxed{0.2}$

Finding the rate of change from 1975-1980

Let us take $(x_1, y_1) = (1975, 14.3)$ and $(x_2, y_2) = (1980, 13.2)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{13.2 - 14.3}{1980 - 1975} \qquad \text{Replacing the values}$$

$$= \frac{-1.1}{5}$$

$$= -0.22$$

Thus the rate of change for the period 1975-1980 is $\boxed{-0.22}$

Finding the rate of change from 1980-1985

Let us take $(x_1, y_1) = (1980, 13.2)$ and $(x_2, y_2) = (1985, 12.4)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{12.4 - 13.2}{1985 - 1980} \qquad \text{Replacing the values}$$

$$= \frac{-0.8}{5}$$

$$= -0.16$$

Thus the rate of change for the period 1980-1985 is $\boxed{-0.16}$

Finding the rate of change from 1985-1990

Let us take $(x_1, y_1) = (1985, 12.4)$ and $(x_2, y_2) = (1990, 11.3)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{11.3 - 12.4}{1990 - 1985} \qquad \text{Replacing the values}$$

$$= \frac{1.1}{5}$$

$$= 0.22$$

Thus the rate of change for the period 1985-1990 is $\boxed{0.22}$

Finding the rate of change from 1990-1995

Let us take $(x_1, y_1) = (1990, 11.3)$ and $(x_2, y_2) = (1995, 12.5)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{12.5 - 11.3}{1995 - 1990} \qquad \text{Replacing the values}$$

$$= \frac{1.2}{5}$$

$$= 0.24$$

Thus the rate of change for the period 1990-1995 is $\boxed{0.24}$

Finding the rate of change from 1995-2000

Let us take $(x_1, y_1) = (1995, 12.5)$ and $(x_2, y_2) = (2000, 13.5)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{13.5 - 12.5}{5} \qquad \text{Replacing the values}$$

$$= \frac{1}{5}$$

$$= 0.2$$

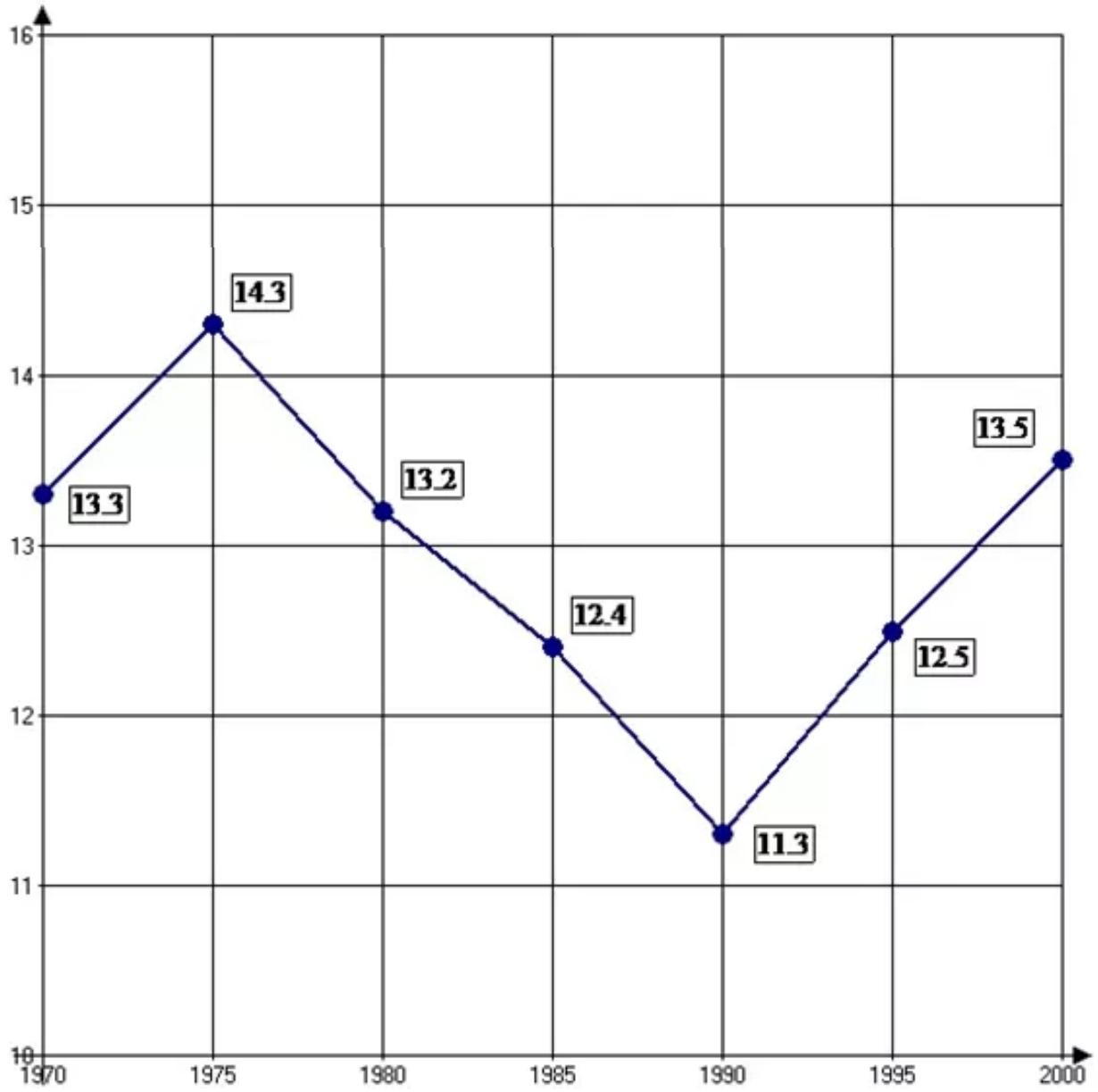
Thus the rate of change for the period 1995-2000 is $\boxed{0.2}$

Thus the rate of change is greatest in $\boxed{1990 - 1995}$ period with $\boxed{0.24}$

And the rate of change is least in $\boxed{1980\text{-}1985}$ period with $\boxed{-0.16}$.

Answer 54PA.

Consider the graph



Need to find the rate of change from $1985 \text{ to } 1990$

Finding the rate of change from $1985\text{-}1990$

Let us take $(x_1, y_1) = (1985, 12.4)$ and $(x_2, y_2) = (1990, 11.3)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{11.3 - 12.4}{1990 - 1985} \qquad \text{Replacing the values}$$

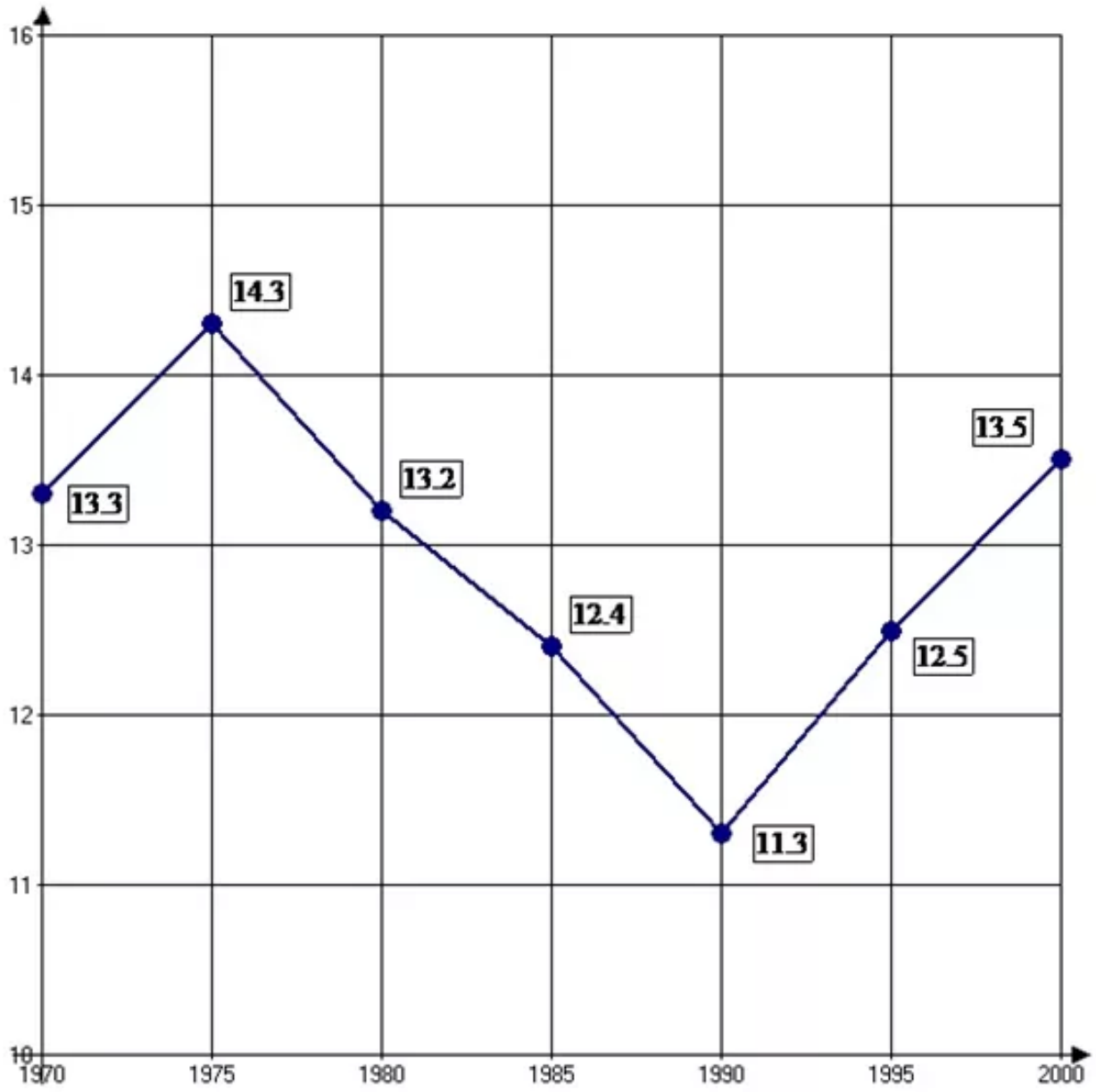
$$= \frac{1.1}{5}$$

$$= 0.22$$

Thus the rate of change for the period $1985\text{-}1990$ is $\boxed{0.22}$

Answer 55PA.

Consider the graph



Need to explain the meaning of the part of the graph with a negative slope

First finding the rate of change from 1970-1975

Let us take $(x_1, y_1) = (1970, 13.3)$ and $(x_2, y_2) = (1975, 14.3)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{14.3 - 13.3}{5} \qquad \text{Replacing the values}$$

$$= \frac{1}{5}$$

$$= 0.2$$

Thus the rate of change for the period 1970-1975 is $\boxed{0.2}$

Finding the rate of change from 1975-1980

Let us take $(x_1, y_1) = (1975, 14.3)$ and $(x_2, y_2) = (1980, 13.2)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{13.2 - 14.3}{1980 - 1975} \qquad \text{Replacing the values}$$

$$= \frac{-1.1}{5}$$

$$= -0.22$$

Thus the rate of change for the period 1975-1980 is $\boxed{-0.22}$

Finding the rate of change from 1980-1985

Let us take $(x_1, y_1) = (1980, 13.2)$ and $(x_2, y_2) = (1985, 12.4)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{12.4 - 13.2}{1985 - 1980} \qquad \text{Replacing the values}$$

$$= \frac{-0.8}{5}$$

$$= -0.16$$

Thus the rate of change for the period 1980-1985 is $\boxed{-0.16}$

Finding the rate of change from 1985-1990

Let us take $(x_1, y_1) = (1985, 12.4)$ and $(x_2, y_2) = (1990, 11.3)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{11.3 - 12.4}{1990 - 1985} \qquad \text{Replacing the values}$$

$$= \frac{1.1}{5}$$

$$= 0.22$$

Thus the rate of change for the period 1985-1990 is $\boxed{0.22}$

Finding the rate of change from $1990\text{-}1995$

Let us take $(x_1, y_1) = (1990, 11.3)$ and $(x_2, y_2) = (1995, 12.5)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{12.5 - 11.3}{1995 - 1990} \qquad \text{Replacing the values}$$

$$= \frac{1.2}{5}$$

$$= 0.24$$

Thus the rate of change for the period $1990\text{-}1995$ is $\boxed{0.24}$

Finding the rate of change from $1995\text{-}2000$

Let us take $(x_1, y_1) = (1995, 12.5)$ and $(x_2, y_2) = (2000, 13.5)$

Slope of the line passing through the points is give by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$= \frac{13.5 - 12.5}{5} \qquad \text{Replacing the values}$$

$$= \frac{1}{5}$$

$$= 0.2$$

When the slope is negative it means that the enrollment is decreasing during the five year period

So the enrollment decreased during the years of $1975\text{-}1990$ period.

Answer 58PA.

Need to explain why slope is important in architecture

The slope of a roof describes how steep it is

It is the number of units the roof rises for each unit of run

If the roof rises 8 feet for each 11 feet of run

$$\text{Slope} = \frac{\text{rise}}{\text{run}}$$

$$= \frac{8}{11}$$

The slope of a line is a number determined by any two points on the line

This number describes how steep the line is

The greater the absolute value of the slope, the steeper the line

Slope is the ratio of the change in the y-coordinates (rise) to the change in the x-coordinate (run) as you move from one point to the other

The slope of a line is the ratio of the rise to the run.

Answer 59PA.

Consider the options

A)positive B)Negative C)Zero D)Undefined

Need to find the slope of the line passing through $(5,-4)$ and $(5,-10)$ and which option is correct

Let us take $(x_1,y_1)=(5,-4)$ and $(x_2,y_2)=(5,-10)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2) is given by

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \text{Slope formulae}$$

$$=\frac{-10-(-4)}{5-5} \qquad \text{Replace } x_1=5, y_1=-4, x_2=5 \text{ and } y_2=-10$$

$$=\frac{-10+4}{0} \qquad \text{Simplify}$$

$$=\text{Undefined}$$

Slope of the line passing through the points is Undefined.

Thus the slope of the line passing through the points is $\boxed{\text{Undefined}}$

Hence the correct option is $\boxed{\text{D UNDEFINED}}$.

Answer 60PA.

Consider the options

$$A)\frac{d-c}{b-a} \qquad B)\frac{b-d}{a-c} \qquad C)\frac{d-b}{a-c} \qquad D)\frac{a-c}{b-d}$$

Need to find the slope of the line passing through (a,b) and (c,d) and which option is correct

Let us take $(x_1,y_1)=(a,b)$ and $(x_2,y_2)=(c,d)$

Slope of the line passing through the points (x_1,y_1) and (x_2,y_2) is given by

$$m=\frac{y_2-y_1}{x_2-x_1} \qquad \text{Slope formulae}$$

$$=\frac{d-b}{c-a} \qquad \text{Replace } x_1=a, y_1=b, x_2=c \text{ and } y_2=d$$

$$=\frac{-1(b-d)}{-1(a-c)} \qquad \left(\begin{array}{l}\text{Take } -1 \text{ as common both in the numerator}\\ \text{and in the denominator}\end{array}\right)$$

$$=\frac{b-d}{a-c} \qquad \text{Simplify}$$

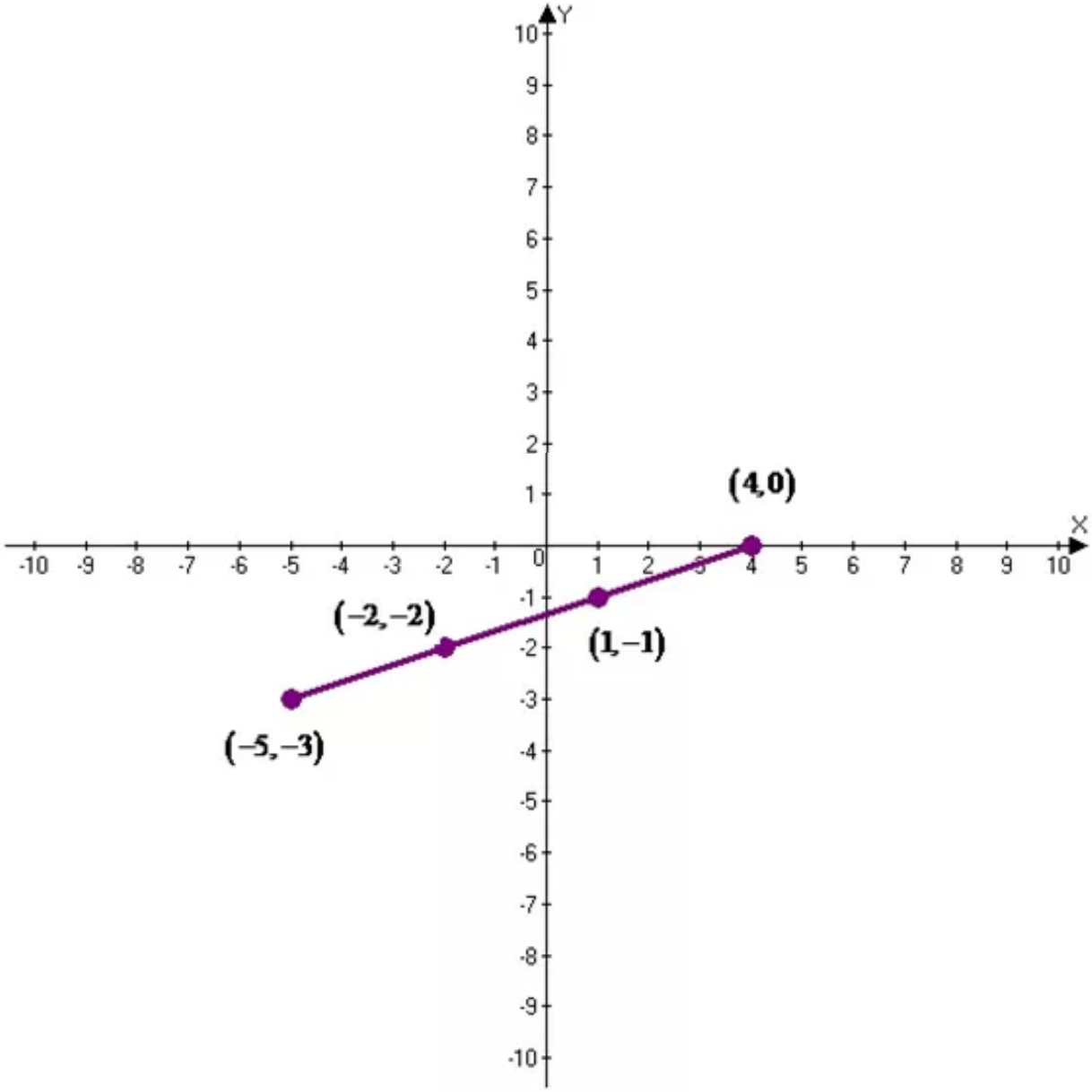
Slope of the line passing through the points is $\frac{b-d}{a-c}$

Thus the slope of the line passing through the points is $\boxed{\frac{b-d}{a-c}}$

Hence the correct option is $\boxed{\text{B } \frac{b-d}{a-c}}$.

Answer 61PA.

Consider the graph



Need to choose four different points from those labeled on the graph and find the slope of the line using the coordinates of each pair of points and describe your findings

Let us take $(x_1, y_1) = (4,0)$ and $(x_2, y_2) = (1,-1)$

Choose the pair of point $(4,0)$ and $(1,-1)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2) is given by

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$ Slope formulae

$$m = \frac{-1-0}{1-4}$$ Replacing the values

$$= \frac{-1}{-3}$$ Simplify

$$= \frac{1}{3}$$

Let us take $(x_1, y_1) = (4, 0)$ and $(x_2, y_2) = (-5, -3)$

Choose the pair of point $(4, 0)$ and $(-5, -3)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2) is given by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$m = \frac{-3 - 0}{-5 - 4} \qquad \text{Replacing the values}$$

$$= \frac{-3}{-9} \qquad \text{Simplify}$$

$$= \frac{1}{3}$$

Let us take $(x_1, y_1) = (4, 0)$ and $(x_2, y_2) = (-2, -2)$

Choose the pair of point $(4, 0)$ and $(-2, -2)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2) is given by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$m = \frac{-2 - 0}{-2 - 4} \qquad \text{Replacing the values}$$

$$= \frac{-2}{-6} \qquad \text{Simplify}$$

$$= \frac{1}{3}$$

Let us take $(x_1, y_1) = (1, -1)$ and $(x_2, y_2) = (-2, -2)$

Choose the pair of point $(1, -1)$ and $(-2, -2)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2) is given by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Slope formulae}$$

$$m = \frac{-2 + 1}{-2 - 1} \qquad \text{Replacing the values}$$

$$= \frac{-1}{-3} \qquad \text{Simplify}$$

$$= \frac{1}{3}$$

Thus the slope is $\boxed{\frac{1}{3}}$

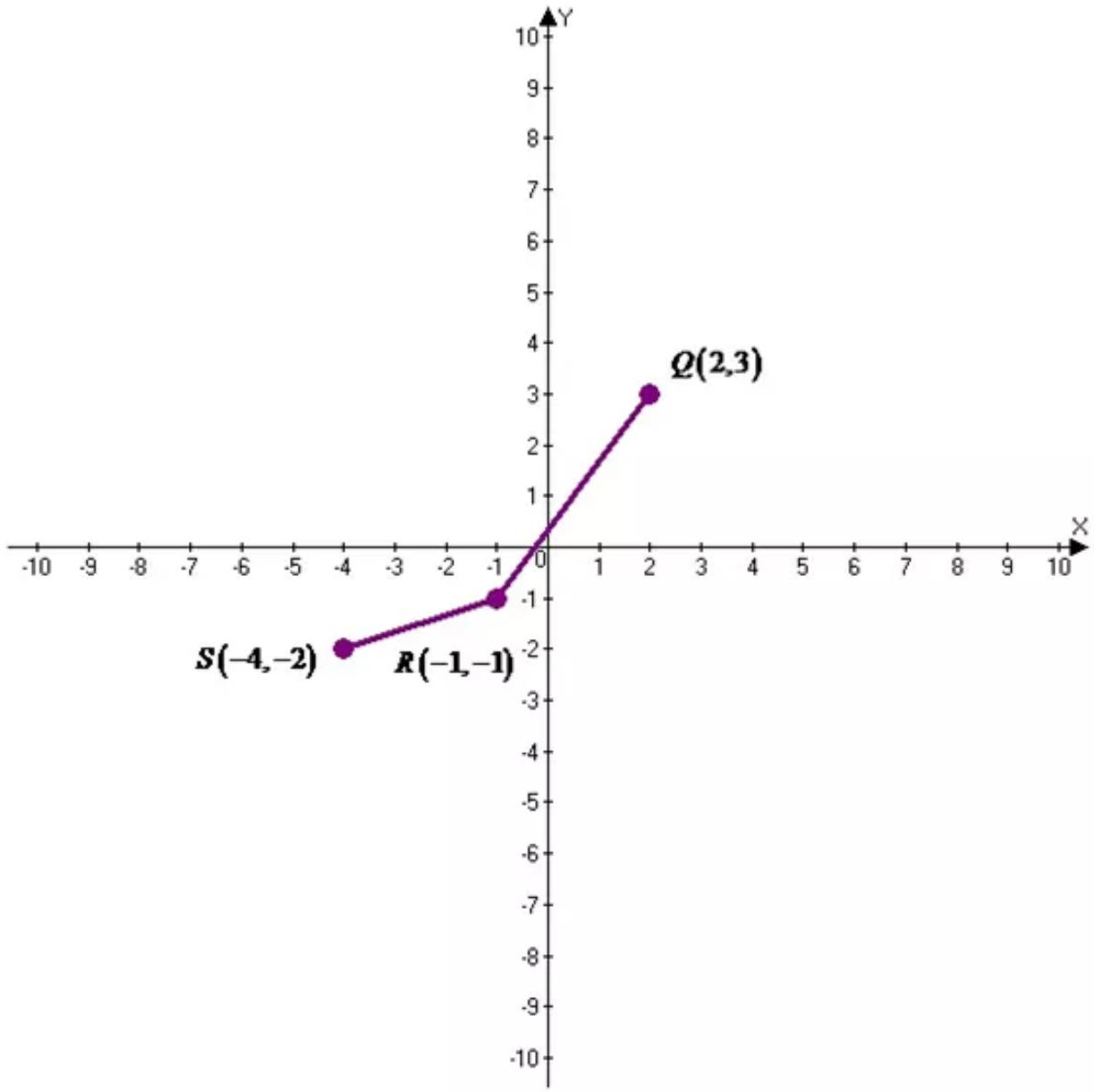
And the slope is the same regardless of points chosen.

Answer 62PA.

Consider the points $Q(2,3)$, $R(-1,-1)$ and $S(-4,-2)$

Need to determine whether the points lie on the same line or not

Let us mark these points on a graph and see whether the points lie on the same line or not



Here the given points passing through the points is not a straight line

Hence the given points does not lie on the same line.

Answer 63MYS.

Consider the table

x	1	2	3	4	5
$f(x)$	5	10	15	20	25

Need to write an equation for the each function

Let us $(x_1, y_1) = (1,5)$ and $(x_2, y_2) = (2,10)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2) is given by

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Slope formulae

$m = \frac{10-5}{2-1}$ Replacing $x_1 = 1, y_1 = 5, x_2 = 2, y_2 = 10$

$m = \frac{5}{1}$ Simplify

$m = 5$

Choose $(1,5)$ and $m = 5$

$y = mx + b$ Slope-intercept form

$5 = 5(1) + b$ Replace $m = 5, x = 1$ and $y = 5$

$5 = 5 + b$ Simplify

$b = 0$ Adding -5 on both sides

Now substituting $m = 5$ and $b = 0$ in $y = mx + b$

$y = mx + b$ Slope-intercept form

$y = (5)x + (0)$ Replace $m = 5$ and $b = 0$

$y = 5x$

Thus the required equation for the function is $\boxed{y = 5x}$.

Answer 64MYS.

Consider the table

x	-2	-1	1	2	4
$f(x)$	13	12	10	9	7

Need to write an equation for the each function

Let us $(x_1, y_1) = (-2,13)$ and $(x_2, y_2) = (-1,12)$

Slope of the line passing through the points (x_1, y_1) and (x_2, y_2) is given by

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Slope formulae

$m = \frac{12-13}{-1-(-2)}$ Replacing $x_1 = -2, y_1 = 13, x_2 = 13, y_2 = 12$

$m = \frac{-1}{1}$ Simplify

$m = -1$

Choose $(-2,13)$ and $m=-1$

$y=mx+b$	Slope-intercept form
$13=-1(-2)+b$	Replace $m=-1, x=-2$ and $y=13$
$13=2+b$	Simplify
$b=11$	Adding -2 on both sides

Now substituting $m=-1$ and $b=11$ in $y=mx+b$

$y=mx+b$	Slope-intercept form
$y=(-1)x+(11)$	Replace $m=-1$ and $b=11$
$y=-x+11$	

Thus the required equation for the function is $\boxed{y=-x+11}$.

Answer 65MYS.

Consider the relation $y=-15$

Need to determine whether the relation is a function or not

A function is a special relationship between the values and a function relates an input to an output

And the output is related somehow to the input

It is often written as "$f(x)$" where x is the value you give it

A constant function is a function whose value is the same for every input value

Constant function is a linear function of the form of $y=b$ where b is a constant and it is also written as $f(x)=b$

The graph of a constant function is a horizontal line

The given function can be written as $f(x)=-15$

It is in the form of $f(x)=b$ so it is a constant function

Thus the given relation is a $\boxed{\text{Constant function}}$.

Answer 66MYS.

Consider the relation $x=5$

Need to determine whether the relation is a function or not

A function is a special relationship between the values and a function relates an input to an output

And the output is related somehow to the input

It is often written as " $f(x)$ " where x is the value you give it

The relation could be $\{(5,1),(5,0),(5,-1),(5,0.3333)\}$

The value of y could be any real number

It means that one value of x is mapping onto multiple values of y

It is not a function

Thus the given relation is not a $\boxed{\text{Function}}$.

Answer 67MYS.

Consider the relation $\{(1,0),(1,4),(-1,1)\}$

Need to determine whether the relation is a function or not

A function is a special relationship between the values and a function relates an input to an output

And the output is related somehow to the input

It is often written as " $f(x)$ " where x is the value you give it

Here x is mapping both the value of 0 and 4

So it is not a function because each value of x has not a unique value of y

Thus the given relation is not a $\boxed{\text{Function}}$.

Answer 68MYS.

Consider the relation $\{(6,3),(5,-2),(2,3)\}$

Need to determine whether the relation is a function or not

A function is a special relationship between the values and a function relates an input to an output

And the output is related somehow to the input

It is often written as " $f(x)$ " where x is the value you give it

Here each value of x has a unique and one value of y

So it is a function with domain of $\{6,5,2\}$ and range is $\{3,-2\}$

Thus the given relation $\{(6,3),(5,-2),(2,3)\}$ is a $\boxed{\text{Function}}$.

Answer 69MYS.

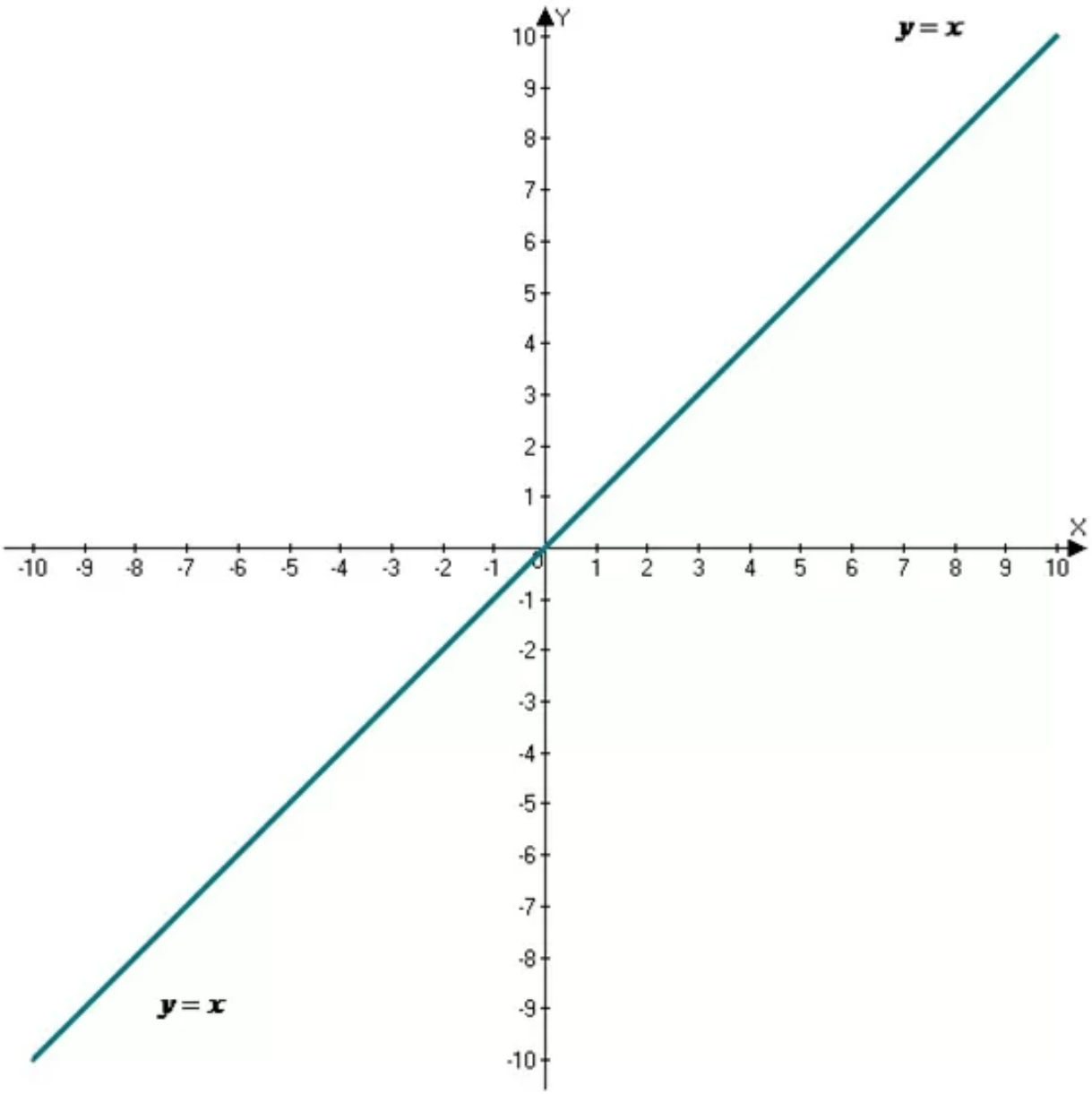
Consider the equation $x - y = 0$

Need to graph the equation

Adding y on both sides

$$\begin{aligned} x - y &= 0 && \text{Original equation} \\ x - y + y &= 0 + y && \text{Adding } y \text{ on both sides} \\ y &= x \end{aligned}$$

The graph of $y = x$ is shown below



Thus the graph is drawn.

Answer 70MYS.

Need to find what number is 40% of 37.5

Let the number be x

And the number is 40% of 37.5 is

$$\begin{aligned} x &= 40\% \times 37.5 \\ &= \frac{40}{100} \times 37.5 \\ &= 0.4 \times 37.5 \\ &= 15 \end{aligned}$$

Hence the number is $\boxed{15}$

The number $\boxed{15}$ is 40% of 37.5.

Answer 71MYS.

Consider the expression:

$7(-3)$.

The objective is to find the product.

The product of two numbers with different signs resulting negative sign.

$7(-3) = -21$ Use calculator.

Thus the required product for the expression $7(-3)$ is $\boxed{-21}$.

Answer 72MYS.

Consider the expression:

$(-4)(-2)$.

The objective is to find the product.

The product of two numbers with same signs resulting positive sign.

$(-4)(-2) = 8$ Use calculator.

Thus the required product for the expression $(-4)(-2)$ is $\boxed{8}$.

Answer 73MYS.

Consider the expression:

$(9)(-4)$.

The objective is to find the product.

The product of two numbers with different signs resulting negative sign.

$9(-4) = -36$ Use calculator.

Thus the required product for the expression $(9)(-4)$ is $\boxed{-36}$.

Answer 74MYS.

Consider the expression $(-8)(3.7)$

Need to find the product

We can write in the given expression 3.7 as $3+0.7$

$$(-8)(3.7)=(-8)(3+0.7)$$

Applying distributive property

$$a(b+c)=ab+ac$$

We can simplify as

$$\begin{aligned}(3+0.7)(-8)&=3(-8)+0.7(-8)\\&=-24-5.6\\&=-29.6\end{aligned}$$

Thus the required product for the given expression is $\boxed{-29.6}$.

Answer 75MYS.

Consider the expression $\left(-\frac{7}{8}\right)\left(\frac{1}{3}\right)$

Need to find the product

It is in the form of $\left(\frac{1}{a}\right)\left(\frac{1}{b}\right)$

The product of $\left(\frac{1}{a}\right)\left(\frac{1}{b}\right)$ is $\left(\frac{1}{a}\right)\left(\frac{1}{b}\right)=\frac{1}{ab}$

Here we have $a=-\frac{7}{8}$ and $b=\frac{1}{3}$

By substituting the values we get

$$\left(\frac{1}{a}\right)\left(\frac{1}{b}\right)=\frac{1}{ab}$$

$$\begin{aligned}\left(-\frac{7}{8}\right)\left(\frac{1}{3}\right)&=\frac{-7\times1}{8\times3}\\&=\frac{-7}{24}\\&=-\frac{7}{24}\end{aligned}$$

Thus the required product for the given expression is $\boxed{-\frac{7}{24}}$.

Answer 76MYS.

Consider the expression $\left(\frac{1}{4}\right)\left(\frac{1}{2}\right)-(14)$

Need to find the product

First finding the product of $\left(\frac{1}{4}\right)\left(\frac{1}{2}\right)$

$$\begin{aligned}\left(\frac{1}{4}\right)\left(\frac{1}{2}\right)-(14)&=\frac{1}{4\times 2}-14\\&=\frac{1}{8}-14\\&=\frac{1-14\times 8}{8}\\&=\frac{-111}{8}\end{aligned}$$

Thus the required product for the given expression is $\boxed{-\frac{111}{8}}$.

Answer 77MYS.

Consider the expression $6\div\frac{2}{3}$

Need to find the quotient

Multiplying both sides by 3

$$\begin{aligned}6\div\frac{2}{3}&=6(3)\div\frac{2}{3}(3) && \text{Multiplying both sides by 3}\\&=18\div 2 && \text{Simplify}\\&=9\end{aligned}$$

Thus the required quotient for the given expression is $\boxed{9}$.

Answer 78MYS.

Consider the expression $12\div\frac{1}{4}$

Need to find the quotient

Multiplying both sides by 4

$$\begin{aligned}12\div\frac{1}{4}&=12(4)\div\frac{1}{4}(4) && \text{Multiplying both sides by 4}\\&=48\div 1 && \text{Simplify}\\&=48\end{aligned}$$

Thus the required quotient for the given expression is $\boxed{48}$.

Answer 79MYS.

Consider the expression $10 \div \frac{3}{8}$

Need to find the quotient

Multiplying both sides by 8

$$10 \div \frac{3}{8} = 10(8) \div \frac{3}{8}(8) \qquad \text{Multiplying both sides by 8}$$
$$= 80 \div 3 \qquad \text{Simplify}$$
$$= 26\frac{2}{3}$$

Thus the required quotient for the given expression is $\boxed{26\frac{2}{3}}$.

Answer 80MYS.

Consider the expression $\frac{1}{2} \div \frac{1}{3}$

Need to find the quotient

Multiplying both sides by 6

$$\frac{1}{2} \div \frac{1}{3} = 6\left(\frac{1}{2}\right) \div 6\left(\frac{1}{3}\right) \qquad \text{Multiplying both sides by 6}$$
$$= 3 \div 2 \qquad \text{Simplify}$$
$$= 1\frac{1}{2}$$

Thus the required quotient for the given expression is $\boxed{1\frac{1}{2}}$.

Answer 81MYS.

Consider the expression $\frac{3}{4} \div \frac{1}{6}$

Need to find the quotient

Multiplying both sides by 24

$$\frac{3}{4} \div \frac{1}{6} = \frac{3}{4}(24) \div \frac{1}{6}(24) \qquad \text{Multiplying both sides by 24}$$
$$= 3(6) \div 4$$
$$= 18 \div 4$$
$$= 4\frac{1}{2}$$

Thus the required quotient for the given expression is $\boxed{4\frac{1}{2}}$.

Answer 82MYS.

Consider the expression $\frac{3}{4}\div 6$

Need to find the quotient

Multiplying both sides by 4

$$\begin{aligned}\frac{3}{4}\div 6 &= \frac{3}{4}(4)\div 6(4) \qquad \text{Multiplying both sides by 4}\\ &= 3(1)\div 24\\ &= 3\div 24\\ &= 0.125\end{aligned}$$

Thus the required quotient for the given expression is $\boxed{0.125}$.

Answer 83MYS.

Consider the expression $18\div\frac{7}{8}$

Need to find the quotient

Multiplying both sides by 8

$$\begin{aligned}18\div\frac{7}{8} &= 18(8)\div\frac{7}{8}(8) \qquad \text{Multiplying both sides by 8}\\ &= 144\div 7\\ &= 20\frac{4}{7}\end{aligned}$$

Thus the required quotient for the given expression is $\boxed{20\frac{4}{7}}$.

Answer 84MYS.

Consider the expression $\frac{3}{8}\div\frac{2}{5}$

Need to find the quotient

Multiplying both sides by 40

$$\begin{aligned}\frac{3}{8}\div\frac{2}{5} &= \frac{3}{8}(40)\div\frac{2}{5}(40) \qquad \text{Multiplying both sides by 40}\\ &= 3(5)\div 2(8)\\ &= 15\div 16\\ &= 0.9375\end{aligned}$$

Thus the required quotient for the given expression is $\boxed{0.9375}$.

Answer 85MYS.

Consider the expression $2\frac{2}{3}\div\frac{1}{4}$

Need to find the quotient

We can simplify as follows

$$2\frac{2}{3}\div\frac{1}{4}=\frac{8}{3}\div\frac{1}{4} \qquad \text{Simplify}$$

$$=\frac{8}{3}(12)\div\frac{1}{4}(12) \qquad \text{Multiplying both sides by 12}$$

$$=32\div 3$$

$$=10\frac{2}{3}$$

Thus the required quotient for the given expression is $\boxed{10\frac{2}{3}}$.