TRIGONEMETRIC EXPANSIONS

SYNOPSIS

- If n is positive integer
  - $\cos n\theta = \cos^n\theta + n_{c_2}\cos^{n-2}\theta\sin^2\theta +$
    $n_{c_4}\cos^{n-4}\theta\sin^4\theta + ...$
  - $\sin n\theta = n_{c_1}\cos^{n-1}\theta\sin\theta - n_{c_3}\cos^{n-3}\theta\sin^3\theta$
    $+n_{c_5}\cos^{n-5}\theta\sin^5\theta - ......$
- When n is odd
  - last term of $\cos n\theta$ is $(-1)^{\frac{n-1}{2}} n\cos\theta\sin^{n-1}\theta$
  - last term of sinn θ is $(-1)^{\frac{n-1}{2}}\sin^n\theta$
- When n is even
  - Last term of cosn θ is $(-1)^{n/2}\sin^n\theta$
  - Last term of $\sin n\theta$ is $(-1)^{\frac{n-2}{2}} n.\cos\theta\cdot\sin^{n-1}\theta$
- If n is a positive integer.
  - $\tan n\theta = \dfrac{n_{c_1}\tan\theta - n_{c_3}\tan^3\theta + n_{c_5}\tan^5\theta.}{1 - n_{c_2}\tan^2\theta + n_{c_4}\tan^4\theta...}$
  - $\cot n\theta =$
    $\dfrac{\cot^n\theta - n_{c_2}\cot^{n-2}\theta + n_{c_4}\cot^{n-4}\theta.}{n_{c_1}\cot^{n-1}\theta - n_{c_3}\cot^{n-3}\theta + n_{c_5}\cot^{n-5}\theta..}$
- If n is a positive integer
  $2^{n-1}\cos^n\theta = \cos n\theta + n_{c_1}\cos(n-2)\theta +$
  $n_{c_2}\cos(n-4)\theta + ..$

LEVEL-I

1. $\sin 4\theta =$
   1) $8\sin^4\theta - 8\sin^2\theta + 1$
   2) $8\cos^4\theta - 8\cot^2\theta + 1$
   3) $4\cos^3\theta\sin\theta - 4\cos\theta\sin^3\theta$
   4) $4\sin^3\theta\cos\theta - 4\sin\theta\cos^3\theta$

2. $\cos 4\theta =$
   1) $8\sin^4\theta - 8\sin^2\theta + 1$
   2) $8\cos^4\theta - 8\cos^2\theta + 1$
   3) $4\cos^3\theta\sin\theta - 4\cos\theta\sin^3\theta$
   4) $4\sin^3\theta\cos\theta - 4\sin\theta\cos^3\theta$

3. $\tan 5\theta =$
   1) $\dfrac{5\tan\theta - 10\tan^3\theta + \tan^5\theta}{1 - 10\tan^2\theta + 5\tan^4\theta}$
   2) $\dfrac{\tan\theta - 10\tan^3\theta + 5\tan^5\theta}{1 - 10\tan^2\theta + 5\tan^4\theta}$
   3) $\dfrac{5\tan\theta - 10\tan^3\theta + \tan^5\theta}{1 - 5\tan^2\theta + 10\tan^4\theta}$
   4) $\dfrac{\tan\theta - 10\tan^3\theta + 5\tan^5\theta}{1 - 10\tan^2\theta + 5\tan^4\theta}$

4. $\cot 4\theta =$
   1) $\dfrac{4\cot^3\theta - 4\cot\theta}{\cot^4\theta - 6\cot^2\theta + 1}$
   2) $\dfrac{4\cot\theta - 4\cot^3\theta}{1 - 6\cot^2\theta + \cot^4\theta}$
   3) $\dfrac{\cot^4\theta - 6\cot^2\theta + 1}{4\cot^3\theta - \cot\theta}$
   4) $\dfrac{1 - 6\cot^2\theta + \cot^4\theta}{4\cot\theta - 4\cot^3\theta}$

5. $\dfrac{\sin 5\theta}{\sin\theta} =$
   1) $(16\cos^4\theta - 12\cos^2\theta + 1)$
   2) $(16\cos^4\theta + 12\cos^2\theta + 1)$
   3) $(16\cot^4\theta - 12\cos^2\theta - 1)$
   4) $(16\cos^4\theta + 12\cos^2\theta - 1)$

6. $\sin 6\theta = 32\cos^5\theta\sin\theta - 32\cos^3\theta\sin\theta +$ 3x then x =
   1) $\cos\theta$ 2) $\sin\theta$ 3) $\cos 2\theta$ 4) $\sin 2\theta$

7. $\frac{\tan 6\theta}{\tan\theta}=$

1) $\frac{6-20\tan^2\theta+6\tan^4\theta}{1-15\tan^2\theta+15\tan^4\theta-\tan^6\theta}$

2) $\frac{1-15\tan^2\theta+15\tan^4\theta-\tan^6\theta}{6-20\tan^2\theta+6\tan^4\theta}$

3) $\frac{6\tan^4\theta-20\tan^2\theta+6}{\tan^6\theta-15\tan^4\theta+15\tan^2\theta-1}$

4) $\frac{\tan^6\theta-15\tan^4\theta+15\tan^2\theta-1}{6\tan^4\theta-20\tan^2\theta+6}$

8. $\frac{\tan 8\theta}{\tan\theta}=$

1) $\frac{8\tan\theta-56\tan^3\theta+56\tan^5\theta-8\tan^7\theta}{1-28\tan^2\theta+70 tan\theta-28\tan^6\theta+\tan^8\theta}$

2) $\frac{8-56\tan^2\theta+56\tan^4\theta-8\tan^6\theta}{1-28\tan^2\theta+70 tan^4\theta-28\tan^6\theta+\tan^8\theta}$

3) $\frac{1-28\tan^2\theta+70 tan^4\theta-28\tan^6\theta+\tan^8\theta}{8\tan\theta+56\tan^3\theta+56\tan^5\theta-8\tan^7\theta}$

4) $\frac{1-28\tan^2\theta+70 tan^4\theta-28\tan^6\theta+\tan^8\theta}{8-56\tan^2\theta+56\tan^4\theta-8\tan^6\theta}$

9. $\cos^4\theta=$

1) $\frac{1}{8}(\cos 4\theta+4\cos 2\theta+3)$

2) $\frac{1}{8}(\cos 4\theta-4\cos 2\theta+3)$

3) $\frac{1}{16}(\cos 4\theta+4\cos 2\theta+3)$

4) $\frac{1}{16}(\cos 4\theta-4\cos 2\theta+3)$

10. $\sin^4\theta=$

1) $\frac{1}{8}(\cos 4\theta+4\cos 2\theta+3)$

2) $\frac{1}{16}(\cos 4\theta-4\cos 2\theta+3)$

3) $\frac{1}{8}(\cos 4\theta-4\cos 2\theta+3)$

4) $\frac{1}{16}(\cos 4\theta+4\cos 2\theta+3)$

11. $\cos^5\theta=$

1) $\frac{1}{16}(\cos 5\theta+5\cos 3\theta+10\cos\theta)$

2) $\frac{1}{16}(\cos 5\theta-5\cos 3\theta+10\cos\theta)$

3) $\frac{1}{32}(\cos 5\theta-5\cos 3\theta+10\cos\theta)$

4) $\frac{1}{32}(\cos 5\theta+5\cos 3\theta+10\cos\theta)$

12. $\sin^5\theta=$

1) $\frac{1}{32}(\sin 5\theta-5\sin 3\theta+10\sin\theta)$

2) $\frac{1}{16}(\sin 5\theta-5\sin 3\theta+10\sin\theta)$

3) $\frac{1}{16}(\sin 5\theta+5\sin 3\theta+10\sin\theta)$

4) $\frac{1}{32}(\sin 5\theta-5\sin 3\theta+10\sin\theta)$

13. $\cos^4\theta+\sin^4\theta=$

1) $\frac{1}{4}(\cos 4\theta-3)$ 2) $\frac{1}{8}(\cos 4\theta-3)$

3) $\frac{1}{4}(\cos 4\theta+3)$ 4) $\frac{1}{8}(\cos 4\theta+3)$

14. $\cos^6\theta+\sin^6\theta=$

1) $\frac{1}{8}(5-3\cos 4\theta+\cos 6\theta)$

2) $\frac{1}{16}(10-\cos 4\theta+\cos 6\theta)$

3) $\frac{1}{8}(5+3\cos 4\theta)$ 4) $\frac{1}{16}(10+\cos 4\theta)$

15. 128 $\cos^7\theta=$

1) $\cos 7\theta+7\cos 5\theta+21\cos 3\theta+35\cos\theta$

2) $\cos 7\theta-7\cos 5\theta+21\cos 3\theta-35\cos\theta$

3) $2\cos 7\theta+14\cos 5\theta+42\cos 3\theta+70\cos\theta$

4) $\cos 7\theta-7\cos 5\theta-21\cos 3\theta+35\cos\theta$

16. $\sin^3 2\theta=$

1) $\frac{1}{4}(\sin 6\theta-3\sin 2\theta)$ 2) $\frac{1}{4}(\sin 6\theta+3\sin 2\theta)$

3) $\frac{1}{4}(3\sin 2\theta-\sin 6\theta)$ 4) $\frac{1}{4}(3\cos 2\theta-\cos 6\theta)$

17. $\cos^4\theta\sin^2\theta =$

1) $\frac{1}{32}(\cos 6\theta + 2\cos 4\theta - \cos 2\theta - 2)$

2) $\frac{1}{32}(\cos 6\theta + 2\cos 4\theta + \cos 2\theta + 2)$

3) $\frac{1}{32}(2 + \cos 2\theta - 2\cos 4\theta - \cos 6\theta)$

4) $\frac{1}{32}(2 + \cos 2\theta + 2\cos 4\theta - \cos 6\theta)$

18. $\sin^5\theta\cos^2\theta =$

1) $\frac{1}{64}(\sin 7\theta - 3\sin 5\theta + \sin 3\theta + 5\sin\theta)$

2) $\frac{1}{64}(2\sin 7\theta + 3\sin 5\theta - \sin 3\theta - 5\sin\theta)$

3) $\frac{1}{64}(2\sin 7\theta - 3\sin 5\theta - \sin 3\theta + 5\sin\theta)$

4) $\frac{1}{32}(2\sin 7\theta - 3\sin 5\theta - \sin 3\theta - 5\sin\theta)$

19. $\cos\theta = \frac{x}{2}$ then $2(1+\cos 8\theta) =$

1) $(x^4 - 4x^2 + 2)$ 2) $(x^4 - 4x^2 - 2)^2$

3) $(x^4 - 4x^2 + 2)^2$ 4) $(x^4 + 4x^2 + 2)^2$

20. The expansion of $\sin^8\theta$ will be the series of

1) sine multiple 2) cosine multiple

3) both sine and cosine multiple

4) can't be determined .

21. The expansion of $\sin^{11}\theta$ will be as the series of

1) sine multiple 2) cosine multiple

3) both sine and cosine multiple

4) can't be determined .

KEY

1. 3	2.2	3.1	4. 3	5. 1
6. 1	7. 1	8. 2	9. 1	10.3
11. 1	12. 2	13. 3	14. 3	15. 3
16.3	17. 3	18.1	19.3	20. 2
21.1				

PREVIOUS EAMCET

1) If $\sin 6\theta = 32\cos^5\theta\sin\theta - 32\cos^3\theta\sin\theta + 3x$ **[2003]**

1) $\cos\theta$ 2) $\cos 2\theta$

3) $\sin\theta$ 4) $\sin 2\theta$

2) $\frac{\sin 5\theta}{\sin\theta} =$ **[2001]**

1) $16\cos^4\theta - 12\cos^2\theta + 1$

2) $16\cos^4\theta + 12\cos^2\theta + 1$

3) $16\cos^4\theta - 12\cos^2\theta - 1$

4) $16\cos^4\theta + 12\cos^2\theta - 1$

KEY

1\. 4 2. 1