

TRIGONOMETRIC FUNCTIONS

SECTION A: (1 MARK)

1. Find the degree measure for the following radian measure: $105^\circ, 14^\circ 19' 5'' - 171^\circ 49' 5''$
 (i) $\frac{7\pi}{12}$ (ii) $\frac{1}{4}$ (iii) -3
2. Find the radian measure for the following degree measure: $-\frac{\pi}{8}, \frac{\pi}{32}, \frac{-3\pi}{2}$
 (i) $-22^\circ 30'$ (ii) $5^\circ 37' 30''$ (iii) -270°
3. The minute hand of a clock is 70cm long. How many centimetres does its tip move in 6 minutes? 44cm
4. Find the values of : (i) $\sin\left(-\frac{21\pi}{4}\right)$ (ii) $\cos\left(\frac{83\pi}{6}\right)$ (iii) $\tan\left(\frac{35\pi}{6}\right)$ (iv) $\frac{1}{\sqrt{2}}, \frac{\sqrt{3}}{2}, \frac{-1}{\sqrt{3}}, -\frac{\sqrt{3}}{2}$
 $\cos 1230^\circ$ (v) $\sin 1125^\circ$ (vi) $\tan 2220^\circ$ $\frac{1}{\sqrt{2}}, \sqrt{3}$

SECTION B: (4 MARKS)

5. A horse is tied to a post by a rope. If the horse moves along a circular path always keeping the rope tight and describes 88m when it has traced out 72° at the centre, find the length of the rope. 70m
6. Prove that $\cos x + \cos\left(\frac{2\pi}{3} + x\right) + \cos\left(\frac{2\pi}{3} - x\right) = 0$
7. Find the values of (i) $\sin(\alpha + \beta)$ (ii) $\cos(\alpha + \beta)$ (iii) $\tan(\alpha + \beta)$, if $\cos \alpha = \frac{-12}{13}$ and $\cos \beta = \frac{24}{7}$, where α lies in the second quadrant and β in the third quadrant. (i) $\frac{-36}{325}$ (ii) $\frac{323}{325}$
(iii) $\frac{-36}{323}$
8. Prove that $\tan 70^\circ = \tan 20^\circ + 2 \tan 50^\circ$
9. Solve the following equations: (i) $\sin 2\theta + \sin 4\theta + \sin 6\theta = 0$
 (ii) $2 \sin^2 \theta + \sin^2 2\theta = 2$
 (iii) $\sqrt{3} \cos \theta + \sin \theta = \sqrt{2}$ (exemplar)
10. Prove that $\frac{\sin \theta + \sin 3\theta + \sin 5\theta + \sin 7\theta}{\cos \theta + \cos 3\theta + \cos 5\theta + \cos 7\theta} = \tan 4\theta$

SECTION C: (6 MARKS)

11. Prove that $\cos 5x = 16\cos^5 x - 20\cos^3 x + 5\cos x$
12. Show that $\cos^2 \frac{\pi}{8} + \cos^2 \frac{3\pi}{8} + \cos^2 \frac{5\pi}{8} + \cos^2 \frac{7\pi}{8} = 2$ (exemplar)
13. Prove that $\frac{\sin 8\theta \cos \theta - \sin 6\theta \cos 3\theta}{\cos 2\theta \cos \theta - \sin 3\theta \sin 4\theta} = \tan 2\theta$
14. Prove that $\sin 10^\circ \sin 50^\circ \sin 60^\circ \sin 70^\circ = \frac{\sqrt{3}}{16}$
15. Prove that $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$
16. Prove that $\frac{(\cos \theta - \cos 3\theta)(\sin 8\theta + \sin 2\theta)}{(\sin 5\theta - \sin \theta)(\cos 4\theta - \cos 6\theta)} = 1$
17. Prove that $\frac{\sec 8\theta - 1}{\sec 4\theta - 1} = \frac{\tan 8\theta}{\tan 2\theta}$ (exemplar)
18. Prove that $\cos^2 A + \cos^2 (A + 120^\circ) + \cos^2 (A - 120^\circ) = \frac{3}{2}$
19. Prove that $\tan 4\theta = \frac{4 \tan \theta (1 - \tan^2 \theta)}{1 - 6 \tan^2 \theta + \tan^4 \theta}$
20. If $0 \leq x \leq 2\pi$, find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$, when
- (i) $\tan x = -\frac{4}{3}$, x lies in quadrant II
 - (ii) $\cos x = -\frac{1}{3}$, x lies in quadrant III
 - (iii) $\sin x = \frac{\sqrt{5}}{3}$, x lies in quadrant II
- (i) $\frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}}, 2$
- (ii) $\sqrt{\frac{2}{3}}, \frac{-1}{\sqrt{3}}, -\sqrt{2}$
- (iii) $\sqrt{\frac{5}{6}}, \frac{1}{\sqrt{6}}, \sqrt{5}$
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