X Elite work-10 (TRIGONOMETRY)

1) $(\sec\theta + \tan\theta)(1-\sin\theta) =$ (a) $\sec\theta$ (b) $\sin\theta$ (c) $\operatorname{cosec}\theta$ (d) $\cos\theta$

2) $2\cos^2\theta + \frac{2}{1+\cot^2\theta} =$ (a) 1 (b) 2 (c) 0 (d) $1/2$

3) Simplified form of $\frac{3-\tan\theta}{3\operatorname{cosec}\theta - \sec\theta}$ is (a) $\cos\theta$ (b) $\sin\theta$ (c) $\operatorname{cosec}\theta$ (d) $\tan\theta$

4) $\frac{2\sin^2 63^\circ + 1 + 2\sin^2 27^\circ}{3\cos^2 17^\circ - 2 + 3\cos^2 73^\circ} =$ (a) $\frac{1}{2}$ (b) $\frac{3}{2}$ (c) 0 (d) 3

5) $\cos(40^\circ+\theta) - \sin(50^\circ-\theta) + \frac{\cos^2 40^\circ + \cos^2 50^\circ}{\sin^2 40^\circ + \sin^2 50^\circ} =$

(a) $\frac{1}{2}$ (b) 1 (c) 0 (d) none of these

6) If $\sqrt{3}\tan\theta = 3\sin\theta$, then $\sin^2\theta - \cos^2\theta =$
(a) $\frac{1}{2}$ (b) 1 (c) $\frac{1}{3}$ (d) $\frac{1}{\sqrt{3}}$

7) $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} =$ (a) $2\sin\theta$ (b) $2\cos\theta$ (c) $2\tan\theta$ (d) $2\operatorname{cosec}\theta$

8) If $\sin\theta = \frac{a}{\sqrt{a^2+b^2}}$, then $\tan\theta =$

(a) $\frac{b}{a}$ (b) $\frac{a}{b}$ (c) $-\frac{a}{b}$ (d) $-\frac{b}{a}$

9) $\frac{\cos\theta}{1-\sin\theta} + \frac{\cos\theta}{1+\sin\theta} =$ (a) $2\sin\theta$ (b) $2\cos\theta$ (c) $2\cos\theta$ (d) $2\sec\theta$

10) $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} =$ (a) $\cot\theta$ (b) $\tan\theta$ (c) $\frac{1}{\sin\theta}$ (d) $\sec\theta$

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Elite work - 10 (TRIGONOMETRY - Answers)

1) $(\sec\theta+\tan\theta)(1-\sin\theta)$ $[\sec\theta = 1/\cos\theta\ ;\ \tan\theta = \sin\theta/\cos\theta]$

$= \left(\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}\right)(1-\sin\theta) = \frac{(1+\sin\theta)(1-\sin\theta)}{\cos\theta} = \frac{1-\sin^2\theta}{\cos\theta}$

$= \frac{\cos^2\theta}{\cos\theta}$ $[\cos^2\theta = 1-\sin^2\theta]$

$= \cos\theta$ (d)

2) $2\cos^2\theta + \frac{2}{1+\cot^2\theta} = 2\cos^2\theta + \frac{2}{\operatorname{cosec}^2\theta} = 2\cos^2\theta + 2\sin^2\theta$

$= 2(\sin^2\theta + \cos^2\theta)$ $[1+\cot^2\theta = \operatorname{cosec}^2\theta\ ;\ \sin\theta = 1/\operatorname{cosec}\theta]$

$= 2$ (b) $[\because \sin^2\theta + \cos^2\theta = 1]$

3) $\frac{3-\tan\theta}{3\operatorname{cosec}\theta - \sec\theta} = \frac{3-\frac{\sin\theta}{\cos\theta}}{\frac{3}{\sin\theta}-\frac{1}{\cos\theta}} = \frac{\frac{3\cos\theta-\sin\theta}{\cos\theta}}{\frac{3\cos\theta-\sin\theta}{\sin\theta\cos\theta}}$

$= \frac{\cancel{3\cos\theta-\sin\theta}}{\cancel{\cos\theta}} \times \frac{\sin\theta\,\cancel{\cos\theta}}{\cancel{3\cos\theta-\sin\theta}} = \sin\theta$ (b)

4) $\frac{2\sin^2 63^\circ + 1 + 2\sin^2 27^\circ}{3\cos^2 17^\circ - 2 + 3\cos^2 73^\circ} = \frac{2\sin^2 63^\circ + 1 + 2\cos^2(90^\circ-27^\circ)}{3\sin^2(90^\circ-17^\circ) - 2 + 3\cos^2 73^\circ}$

$= \frac{2\sin^2 63^\circ + 2\cos^2 63^\circ + 1}{3\sin^2 73^\circ + 3\cos^2 73^\circ - 2}$

$[\sin(90^\circ-\theta) = \cos\theta\ ;\ \cos(90^\circ-\theta) = \sin\theta]$

$= \frac{2(\sin^2 63^\circ + \cos^2 63^\circ) + 1}{3(\sin^2 73^\circ + \cos^2 73^\circ) - 2}$

$= \frac{2+1}{3-2}$ $[\because \sin^2\theta + \cos^2\theta = 1]$

$= 3$ (d)

5) $\cos(40^\circ+\theta) - \sin(50^\circ-\theta) + \frac{\cos^2 40^\circ + \cos^2 50^\circ}{\sin^2 40^\circ + \sin^2 50^\circ}$

$= \sin(90^\circ-(40^\circ+\theta)) - \sin(50^\circ-\theta) + \frac{\sin^2(90^\circ-40^\circ) + \cos^2 50^\circ}{\sin^2 40^\circ + \cos^2(90^\circ-50^\circ)}$

$= \sin(90^\circ-40^\circ-\theta) - \sin(50^\circ-\theta) + \frac{\sin^2 50^\circ + \cos^2 50^\circ}{\sin^2 40^\circ + \cos^2 40^\circ}$

$= \cancel{\sin(50^\circ-\theta)} - \cancel{\sin(50^\circ-\theta)} + \frac{1}{1}$

$= 1$ (b) $[\sin(90^\circ-\theta) = \cos\theta\ ;\ \sin^2\theta + \cos^2\theta = 1]$

6) $\sqrt{3}\tan\theta = 3\sin\theta$

$\sqrt{3} \times \dfrac{\cancel{\sin\theta}}{\cos\theta} = 3\cancel{\sin\theta}$ $\left[\because \tan\theta = \dfrac{\sin\theta}{\cos\theta}\right]$

$\cos\theta = \dfrac{\sqrt{3}}{3} = \dfrac{1}{\sqrt{3}}$ //

$\therefore \sin^2\theta - \cos^2\theta = 1 - \cos^2\theta - \cos^2\theta$ $[\because \sin^2\theta = 1 - \cos^2\theta]$

$= 1 - 2\cos^2\theta = 1 - 2 \times \dfrac{1}{3} = \dfrac{3-2}{3} = \dfrac{1}{3}$ (c)

7) $\dfrac{\sin\theta}{1+\cos\theta} + \dfrac{1+\cos\theta}{\sin\theta} = \dfrac{\sin^2\theta + (1+\cos\theta)^2}{\sin\theta(1+\cos\theta)}$

$= \dfrac{\sin^2\theta + 1 + \cos^2\theta + 2\cos\theta}{\sin\theta(1+\cos\theta)}$

$= \dfrac{1+1+2\cos\theta}{\sin\theta(1+\cos\theta)}$

$= \dfrac{2+2\cos\theta}{\sin\theta(1+\cos\theta)} = \dfrac{2\cancel{(1+\cos\theta)}}{\sin\theta\cancel{(1+\cos\theta)}}$

$= \dfrac{2}{\sin\theta} = 2\operatorname{cosec}\theta$ (d)

8) $\sin\theta = \dfrac{a}{\sqrt{a^2+b^2}}$

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$$\cos^2\theta = 1 - \sin^2\theta$$
$$= 1 - \frac{a^2}{a^2+b^2}$$
$$= \frac{\cancel{a^2}+b^2-\cancel{a^2}}{a^2+b^2} = \frac{b^2}{a^2+b^2}$$
$$\therefore \cos\theta = \frac{b}{\sqrt{a^2+b^2}}$$
Then, $\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{a}{\cancel{\sqrt{a^2+b^2}}} \times \frac{\cancel{\sqrt{a^2+b^2}}}{b}$
$$= \frac{a}{b} \text{ (b)}$$

9) $$\frac{\cos\theta}{1-\sin\theta} + \frac{\cos\theta}{1+\sin\theta} = \cos\theta\left[\frac{1}{1-\sin\theta} + \frac{1}{1+\sin\theta}\right]$$
$$= \cos\theta\left[\frac{1+\cancel{\sin\theta}+1-\cancel{\sin\theta}}{1-\sin^2\theta}\right]$$
$$= \cos\theta \times \frac{2}{\cos^2\theta} \quad [\because \cos^2\theta = 1-\sin^2\theta]$$
$$= \frac{2}{\cos\theta}$$
$$= 2\sec\theta \text{ (d)} \quad [\because \sec\theta = 1/\cos\theta]$$

10) $$\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \frac{\sin\theta(1-2\sin^2\theta)}{\cos\theta(2\cos^2\theta-1)}$$
$$= \frac{\tan\theta(1-2\sin^2\theta)}{(2(1-\sin^2\theta)-1)} \quad \left[\because \tan\theta = \frac{\sin\theta}{\cos\theta}\right]$$
$$= \frac{\tan\theta(1-2\sin^2\theta)}{2-2\sin^2\theta-1} \quad [\because \cos^2\theta = 1-\sin^2\theta]$$
$$= \frac{\tan\theta\cancel{(1-2\sin^2\theta)}}{\cancel{1-2\sin^2\theta}} = \tan\theta \text{ (b)}$$

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