BHARAT SCHOOL OF BANKING
TRIGONOMETRY

Q1. If cosθ + secθ = 2, the value of $\cos^6\theta + \sec^6\theta$ is
(a) 4
(b) 8
(c) 1
(d) 2

S1. Ans. (d)
Sol. $\cos\theta + \sec\theta = 2$
Put $\theta = 0°$
$\cos 0° + \sec 0° = 2$
$\Rightarrow 1 + 1 = 2 \Rightarrow 2 = 2$
$= \cos^6\theta + \sec^6\theta$
$= \cos^6 0° + \sec^6 0°$
$= (1)^6 + (1)^6 = 1 + 1 = 2$

Q2. If 5 tanθ = 4, then $\frac{5\sin\theta - 3\cos\theta}{5\sin\theta + 2\cos\theta}$ is equal to
(a) $\frac{2}{3}$
(b) $\frac{1}{4}$
(c) $\frac{1}{6}$
(d) $\frac{1}{3}$

S2. Ans. (c)

Sol. ∴ $5 \tan\theta = 4$

$\Rightarrow \tan\theta = \frac{4}{5}$, $\frac{5\sin\theta - 3\cos\theta}{5\sin\theta + 2\cos\theta}$

Divide numerator and denominator by $\cos\theta$

$$= \frac{5\frac{\sin\theta}{\cos\theta} - 3\frac{\cos\theta}{\cos\theta}}{5\frac{\sin\theta}{\cos\theta} + 2\frac{\cos\theta}{\cos\theta}} = \frac{5\tan\theta - 3}{5\tan\theta + 2}$$

$$= \frac{\left(5 \times \frac{4}{5}\right) - 3}{\left(5 \times \frac{4}{5}\right) + 2} = \frac{1}{6}$$

Q3. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, then $\cos\theta - \sin\theta$ is

(a) $\sqrt{2}\tan\theta$

(b) $-\sqrt{2}\cos\theta$

(c) $-\sqrt{2}\sin\theta$

(d) $\sqrt{2}\sin\theta$

S3. Ans. (d)

Sol. $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$

Squaring both sides,

$\Rightarrow \cos^2\theta + \sin^2\theta + 2\cos\theta\sin\theta = 2\cos^2\theta$

$= 2\cos^2\theta - \cos^2\theta - \sin^2\theta = 2\cos\theta\sin\theta$

$= \cos^2\theta - \sin^2\theta = 2\sin\theta.\cos\theta$

$= (\cos\theta - \sin\theta)(\cos\theta + \sin\theta) = 2\sin\theta.\cos\theta$

$= (\cos\theta - \sin\theta)\left(\sqrt{2}\cos\theta\right) = 2\sin\theta.\cos\theta$

$= \cos\theta - \sin\theta = \frac{2\sin\theta.\cos\theta}{\sqrt{2}\cos\theta}$

$= \sqrt{2}\sin\theta$

Q4. The value of $\frac{\cos^2 60° + 4\sec^2 30° - \tan^2 45°}{\sin^2 30° + \cos^2 30°}$

(a) $\frac{64}{\sqrt{3}}$

(b) $\frac{55}{12}$

(c) $\frac{67}{12}$

(d) $\frac{67}{10}$

S4. Ans. (b)

Sol.

$$\frac{\cos^2 60°+4\sec^2 30°-\tan^2 45°}{\sin^2 30°+\cos^2 30°}$$

$$= \frac{\left(\frac{1}{2}\right)^2+4\left(\frac{2}{\sqrt{3}}\right)^2-1^2}{1}$$

$(\because \sin^2 A + \cos^2 A = 1)$

$$= \frac{1}{4} + \frac{4\times 4}{3} - 1 = \frac{1}{4} + \frac{16}{3} - 1$$

$$= \frac{3+64-12}{12} = \frac{55}{12}$$

Q5. If $\tan\theta = \frac{p}{q}$, then what is $\frac{p\sec\theta - q\operatorname{cosec}\theta}{p\sec\theta + q\operatorname{cosec}\theta}$ equal to?

(a) $\frac{p-q}{p+q}$

(b) $\frac{q^2-p^2}{q^2+p^2}$

(c) $\frac{p^2-q^2}{q^2+p^2}$

(d) 1

S5. Ans. (c)

Sol.

$\tan\theta = \frac{p}{q}$

$$= \frac{p\sec\theta - q\operatorname{cosec}\theta}{p\sec\theta + q\operatorname{cosec}\theta}$$

$$= \frac{\operatorname{cosec}\theta\left(\frac{p\sec\theta}{\operatorname{cosec}\theta} - q\right)}{\operatorname{cosec}\theta\left(\frac{p\sec\theta}{\operatorname{cosec}} + q\right)}$$

$$= \frac{p\tan\theta - q}{p\tan\theta + q}$$

$$= \frac{p\times\frac{p}{q} - q}{p\times\frac{p}{q} + q}$$

$$= \frac{p^2-q^2}{p^2+q^2}$$

Q6. The value of $(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \tan\theta + \sec\theta)$ is equal to
(a) 1
(b) 2
(c) 0
(d) -1

S6. Ans. (b)
Sol. $(1 + \cot\theta - \operatorname{cosec}\theta)$
$(1 + \tan\theta + \sec\theta)$
Put, $\theta = 45°$
$= (1 + \cot 45° - \operatorname{cosec} 45°)$
$(1 + \tan 45° + \sec 45°)$
$= (1 + 1 - \sqrt{2})(1 + 1 + \sqrt{2})$
$= (2 - \sqrt{2})(2 + \sqrt{2})$
$= \left[2^2 - (\sqrt{2})^2\right]$
$= 4 - 2 = 2$

Q7. The elimination of θ from $x\cos\theta - y\sin\theta = 2$ and $x\sin\theta + y\cos\theta = 4$ will give
(a) $x^2 + y^2 = 20$
(b) $3x^2 + y^2 = 20$
(c) $x^2 - y^2 = 20$
(d) $3x^2 - y^2 = 10$

S7. Ans. (a)

Sol. x sin θ + y cos θ = 4

Squaring both sides,

$x^2 \sin^2 \theta + y^2 \cos^2 \theta + 2xy \sin \theta . \cos \theta = 16$ ...(i)

x cos θ - y sin θ = 2

again squaring both sides,

$x^2 \cos^2 \theta + y^2 \sin^2 \theta - 2xy \sin \theta . \cos \theta = 4$ ...(ii)

on adding equation (i) and (ii),

$(x^2 + y^2)(\sin^2 \theta + \cos^2 \theta)$

= 16 + 4

$x^2 + y^2 = 20$

Q8. If $\tan \theta = \frac{\sin \alpha - \cos \alpha}{\sin \alpha + \cos \alpha}$, then sin α + cos α is

(a) $\pm\sqrt{2} \sin \theta$

(b) $\pm \sqrt{2} \cos \theta$

(c) $\pm \frac{1}{\sqrt{2}} \sin \theta$

(d) $\pm \frac{1}{\sqrt{2}} \cos \theta$

S8. Ans. (b)

Sol.

$\tan\theta = \frac{\sin\alpha - \cos\alpha}{\sin\alpha + \cos\alpha}$

Squaring both sides and after that adding '1' both sides,

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

$= \sec^2\theta$

$= \frac{(\sin\alpha + \cos\alpha)^2 + (\sin\alpha - \cos\alpha)^2}{(\sin\alpha + \cos\alpha)^2}$

$(\therefore 1 + \tan^2\theta = \sec^2\theta)$

$\sec^2\theta = \frac{2\,(\sin^2\alpha + \cos^2\alpha)}{(\sin\alpha + \cos\alpha)^2}$

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

$= \frac{1}{\cos\theta} = \frac{\pm\sqrt{2}}{\sin\alpha + \cos\alpha}$

$= \sin\alpha + \cos\alpha = \pm\sqrt{2}\cos\theta$

Q9. If $\sec\theta + \tan\theta = 5$ then the value of $\frac{\tan\theta + 1}{\tan\theta - 1}$ is

(a) $\frac{11}{7}$

(b) $\frac{13}{7}$

(c) $\frac{15}{7}$

(d) $\frac{17}{7}$

S9. Ans. (d)

Sol. If $\sec\theta + \tan\theta = 5$ ....(i)

$\therefore \sec^2\theta - \tan^2\theta = 1$

$(\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$(\sec\theta - \tan\theta) = \frac{1}{5}$ ....(ii)

Subtracting equation (ii) from (i)

$= (\sec\theta + \tan\theta) - (\sec\theta - \tan\theta)$

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

$2\tan\theta = \frac{25-1}{5} = \frac{24}{5}$

$\tan\theta = \frac{12}{5}$

$= \frac{\tan\theta+1}{\tan\theta-1} = \frac{\frac{12}{5}+1}{\frac{12}{5}-1} = \frac{12+5}{12-5} = \frac{17}{7}$

Q10. If $(\sin\alpha + \operatorname{cosec}\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$, then the value of k is

(a) 1
(b) 7
(c) 3
(d) 5

S10. Ans. (b)

Sol.

$(\sin\alpha + \operatorname{cosec}\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha\ + \cot^2\alpha$

Put $\alpha = 45°$,

$(\sin 45° + \operatorname{cosec} 45°)^2 + (\cos 45° + \sec 45°)^2 = K + \tan^2 45° + \cot^2 45°$

$= \left(\frac{1}{\sqrt{2}} + \sqrt{2}\right)^2 + \left(\frac{1}{\sqrt{2}} + \sqrt{2}\right)^2 = k + 1 + 1$

$\frac{1}{2} + 2 + \left(2\sqrt{2}\frac{1}{\sqrt{2}}\right) + \frac{1}{2} + 2 + \left(2\sqrt{2} \times \frac{1}{\sqrt{2}}\right)$

$= k + 2$

$= 4\frac{1}{2} + 4\frac{1}{2} = k + 2 \Rightarrow k = 7$