

1. D—The period is $2\pi = \frac{\pi}{b}$, so $b = \frac{1}{2}$. Also, since the graph is “flipped over” the tan function is multiplied by -1.

2. E--The only choice that has an upward shift of 4 units.

3. A--

$$\begin{aligned} \sin^2\left(\frac{\pi}{2} - x\right) \tan^2 x + \cos^2(-x) + \tan^2 x \\ = \cos^2 x \left(\frac{\sin^2 x}{\cos^2 x}\right) + \cos^2 x + \tan^2 x \\ = \sin^2 x + \cos^2 x + \tan^2 x \\ = 1 + \tan^2 x \\ = \sec^2 x \end{aligned}$$

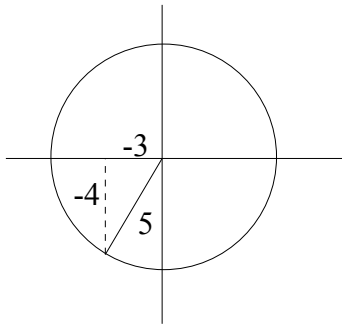
4. E--

$$\begin{aligned} \cos x (\tan^2 x - 1) = 0 \quad \cos x = 0 \quad \text{when } x = \frac{\pi}{2} \quad \text{or} \quad \frac{3\pi}{2}, \text{ but } \tan x \text{ is undefined for these values.} \\ \cos x = 0 \quad \text{or} \quad \tan^2 x - 1 = 0 \end{aligned}$$

5. D--

$$\tan\left(\frac{5\pi}{12}\right) = \tan\left(\frac{\frac{5\pi}{6}}{2}\right) = \frac{\sin \frac{5\pi}{6}}{1 + \cos \frac{5\pi}{6}} = \frac{\frac{1}{2}}{1 - \frac{\sqrt{3}}{2}} = \frac{1}{(2 - \sqrt{3})} \cdot \frac{(2 + \sqrt{3})}{(2 + \sqrt{3})} = 2 + \sqrt{3}$$

6. E--



7. B-- Draw a sketch and observe that the amplitude is 2 and the period is $\pi/2$, and when $x = 0$, $y = 2$

8. B--

$$\begin{aligned} \tan x \sin 2x + 2 \sin^2 x &= -1 + 4 \sin x \\ \left(\frac{\sin x}{\cos x}\right) 2 \sin x \cos x + 2 \sin^2 x - 4 \sin x + 1 &= 0 \\ 2 \sin^2 x + 2 \sin^2 x - 4 \sin x + 1 &= 0 \\ 4 \sin^2 x - 4 \sin x + 1 &= 0 \\ (2 \sin x - 1)^2 &= 0 \\ \sin x = \frac{1}{2} \quad x = \frac{\pi}{6} \quad \text{or} \quad \frac{5\pi}{6} \end{aligned}$$

9. C--

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