3.8 The Tangent Function

AP Precalculus

Solutions

3.8 Practice

Write an equation that represents all asymptotes of the graph of f in the xy-plane.

1. $f(\theta) = \tan(3\theta)$

Period = $\frac{\pi}{3}$ V.A at $x = -\frac{\pi}{6}, \frac{\pi}{6}$

$\theta = \frac{\pi}{6} + k\frac{\pi}{3}$, for integer values of k.

2. $f(\theta) = \tan(6\theta)$

Period = $\frac{\pi}{6}$ V.A at $x = -\frac{\pi}{12}, \frac{\pi}{12}$

$\theta = \frac{\pi}{12} + k\frac{\pi}{6}$, for integer values of k.

3. $f(\theta) = \tan\left(\frac{\theta}{5}\right)$

Period = 5π VA at $x = -\frac{5\pi}{2}, \frac{5\pi}{2}$

$\theta = \frac{5\pi}{2} + k5\pi$, for integer values of k.

In the xy-plane, the angle θ is in standard position. What is the slope of the terminal ray of the angle?

4. $\theta = \frac{\pi}{6}$

$\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ (sin θ / cos θ)

5. $\theta = \frac{3\pi}{4}$

$\frac{\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}} = -1$

6. $\theta = \frac{5\pi}{3}$

$\frac{-\frac{\sqrt{3}}{2}}{\frac{1}{2}} = -\sqrt{3}$

Evaluate.

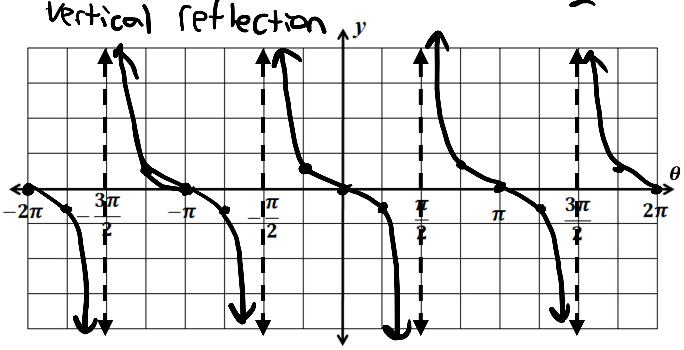
7. $\tan\frac{\pi}{2}$ $\frac{\sin\theta}{\cos\theta}$ $\frac{1}{0}$ = **undefined**	8. $\tan\frac{4\pi}{3}$ $\frac{-\sqrt{3}/2}{-1/2} = \sqrt{3}$	9. $\tan\frac{5\pi}{4}$ $\frac{-\sqrt{2}/2}{-\sqrt{2}/2} = 1$	10. $\tan\frac{11\pi}{6}$ $\frac{-1/2}{\sqrt{3}/2} = \frac{-1}{\sqrt{3}} = -\frac{\sqrt{3}}{3}$

Graph each trig function.

11. $y = -\frac{1}{2}\tan\theta$

Period = π V.A. at $x = -\frac{\pi}{2}$, $x = \frac{\pi}{2}$

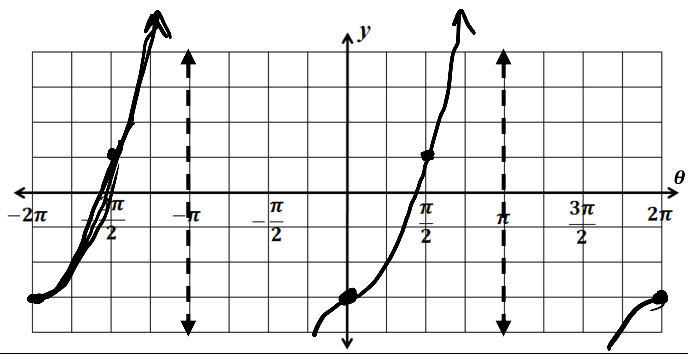
vertical reflection



12. $y = 4\tan\left(\frac{1}{2}\theta\right) - 3$

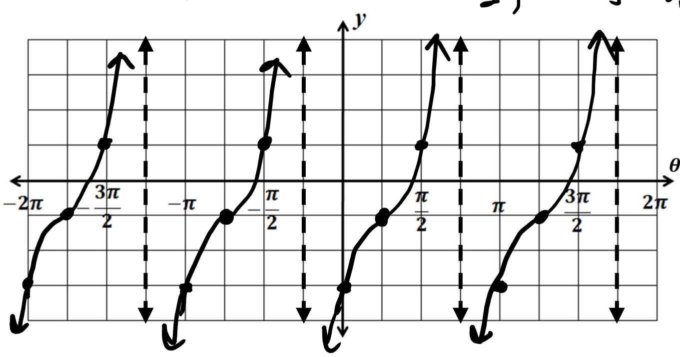
V.A. at $x = \pm\pi$

Period = 2π



13. $y = 2\tan\left(\theta - \frac{\pi}{4}\right) - 1$

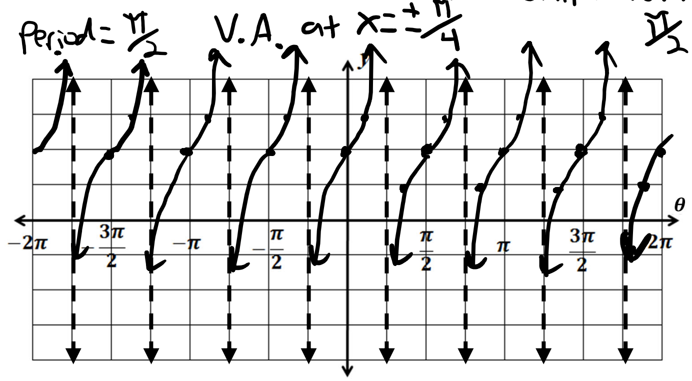
period = π, V.A. at $x = \pm\frac{\pi}{2}$, shift right $\frac{\pi}{4}$



14. $y = \tan(2\theta + \pi) + 2$

$2(\theta + \frac{\pi}{2})$

Period = $\frac{\pi}{2}$ V.A. at $x = \pm\frac{\pi}{4}$ shift left $\frac{\pi}{2}$



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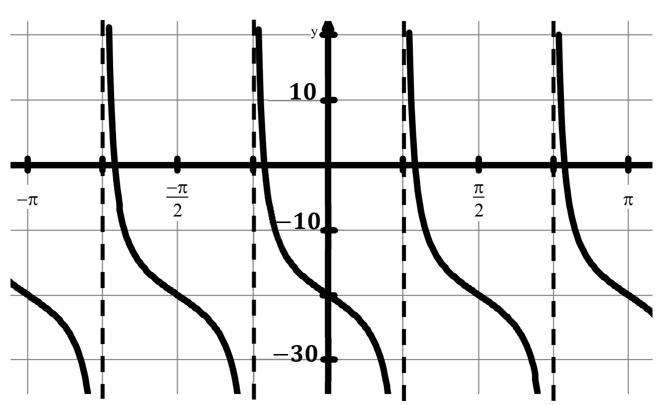
3.8 Test Prep

15. The graph of the function g is given in the xy-plane. If $g(x) = a\tan(bx) - 20$, where a and b are constants, which of the following could be true?

I. If $a > 0$ then $b > 1$
II. If $a > 0$ then $b < 0$ ✓
III. If $a < 0$ then $b > 1$ ✓
IV. If $a < 0$ then $b < 0$

(A) III only
(B) IV only
(C) I and IV only
(D) II and III only (circled)



Graph of g

16. The graph of $f(x) = \tan(bx)$, where b is a constant, is shown in the xy-plane. What is the value of b?

Period = 4

$\frac{\pi}{b} = 4$

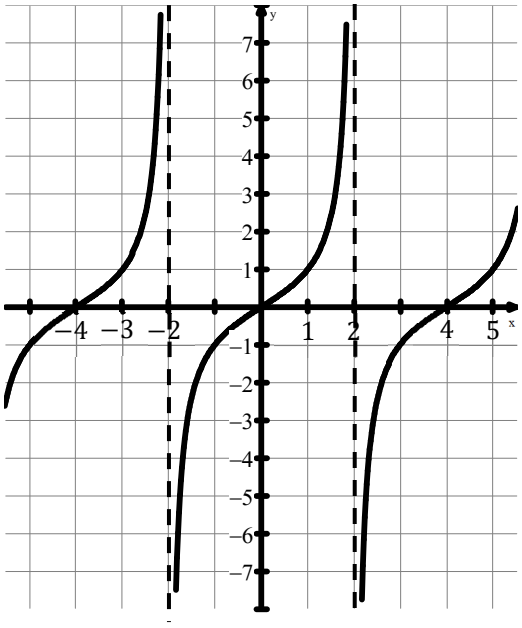
$\frac{\pi}{4} = b$

(A) 4

(B) 2

(C) $\frac{\pi}{2}$

(D) $\frac{\pi}{4}$



Graph of f

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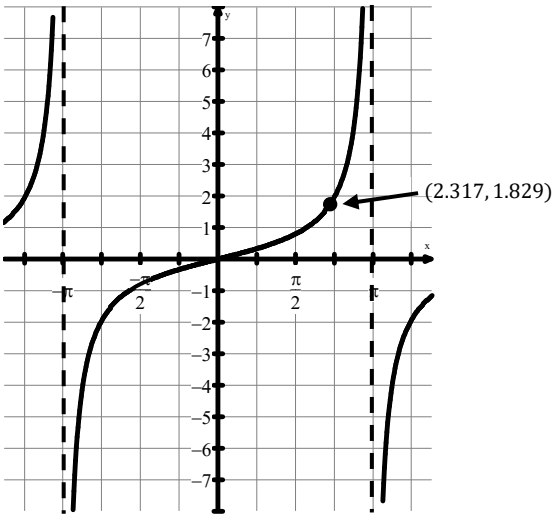
17. The figures shows the graph of $f(x) = a\tan(bx)$, where a and b are constants, in the xy-plane. The graph of f has two vertical asymptotes at $x = -\pi$ and $x = \pi$, and a point with coordinates given is on the graph of f. What are all solutions to $f(x) = 1.829$?

(A) $x = 2.317$ only

(B) $x = 2.317 + \pi k$, where k is any integer

(C) $x = 2.317 + 2\pi k$, where k is any integer

(D) $x = 2.317 + 3\pi k$, where k is any integer



Graph of f

period is 2π, so the function's y-value will repeat every 2π.