

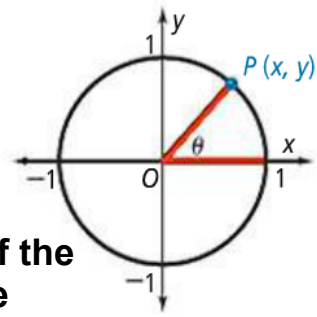
13-6 The Tangent Function

take note

Key Concept Tangent of an Angle

Suppose the terminal side of an angle θ in standard position intersects the unit circle at the point (x, y) . Then the ratio $\frac{y}{x}$ is the **tangent of θ** , denoted $\tan \theta$.

In this diagram, $x = \cos \theta$, $y = \sin \theta$, and $\frac{y}{x} = \tan \theta$.

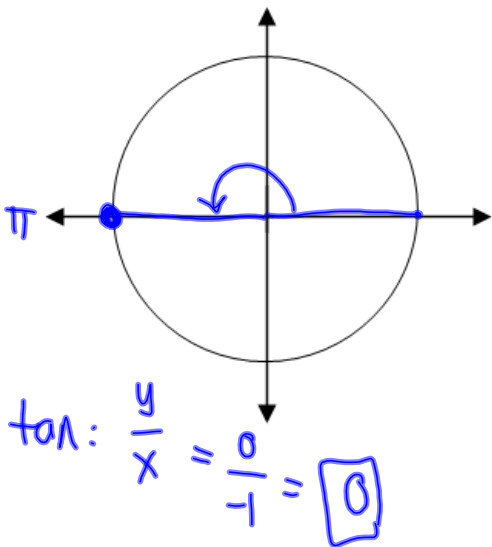


Tangent is the "slope" (y/x) of the radius of the unit circle as the point P moves around the unit circle.

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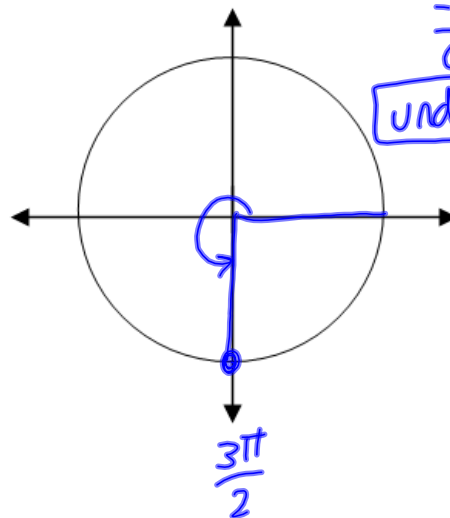
Ex. 1 Find the exact value of each tangent.

$\tan \pi$



$\tan \frac{3\pi}{2}$

tan: $\frac{y}{x}$
 $\frac{-1}{0}$
 undefined



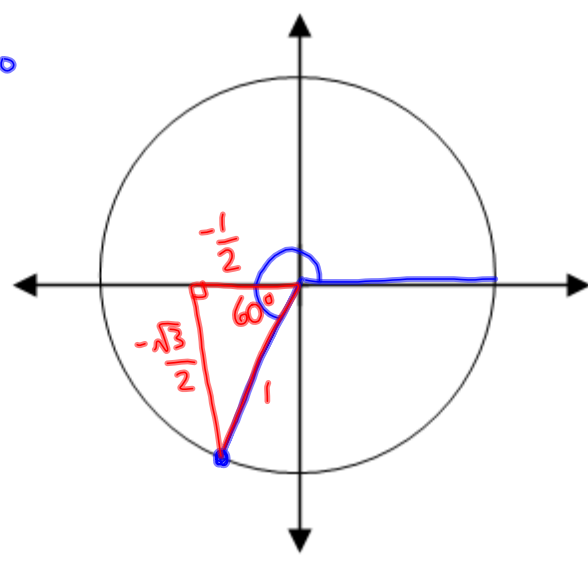
Apr 22-8:00 AM

Ex. 1 Find the exact value of each tangent.

$$\tan \frac{4\pi}{3} \cdot \frac{180}{\pi} \rightarrow 240^\circ$$

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

$$= \frac{\sqrt{3}}{2} \cdot \frac{2}{1} = \boxed{\sqrt{3}}$$



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Take note

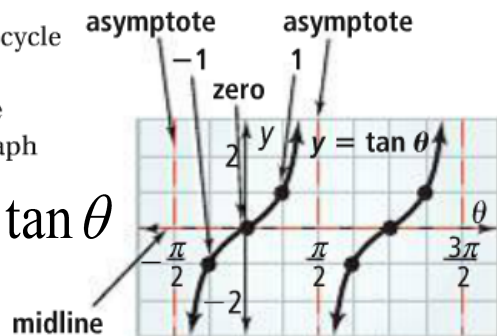
Concept Summary Properties of Tangent Functions

Suppose $y = a \tan b\theta$, with $a \neq 0$, $b > 0$, and θ in radians.

- $\frac{\pi}{b}$ is the period of the function.
- One cycle occurs in the interval from $-\frac{\pi}{2b}$ to $\frac{\pi}{2b}$.
- There are vertical asymptotes at each end of the cycle.

You can use asymptotes and three points to sketch one cycle of a tangent curve. As with sine and cosine, the five elements are equally spaced through one cycle. Use the pattern asymptote-(-a)-zero-(a)-asymptote. In the graph at the right, $a = b = 1$.

$$y = \tan \theta$$

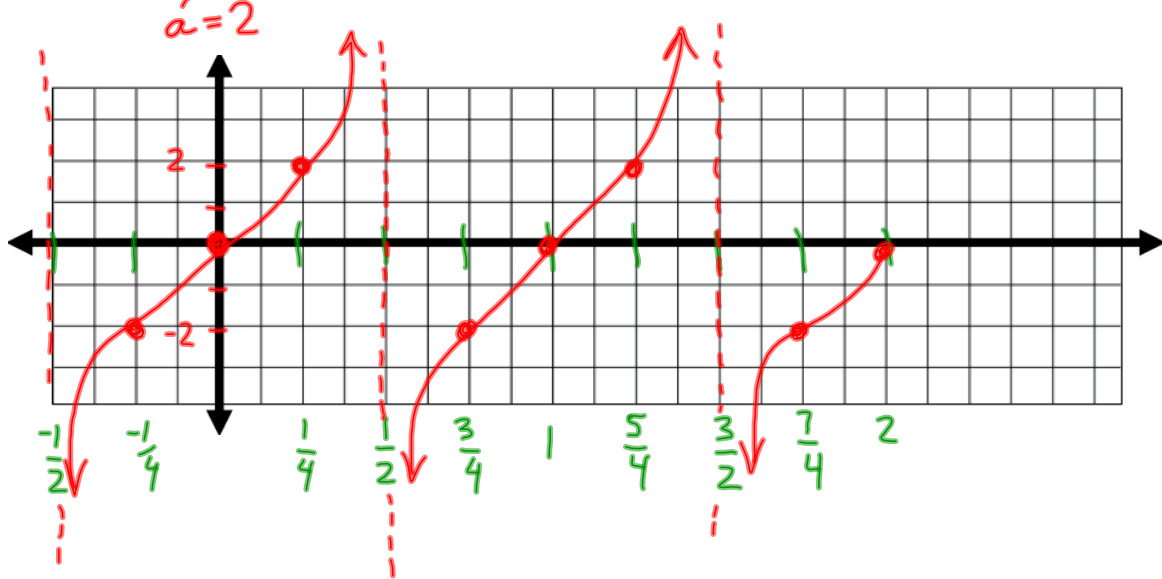


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Ex.2 Graph two cycles of the following.

$$y = 2 \tan \pi \theta$$

Period: $\frac{\pi}{b} = \frac{\pi}{\pi} = 1 \div 4$

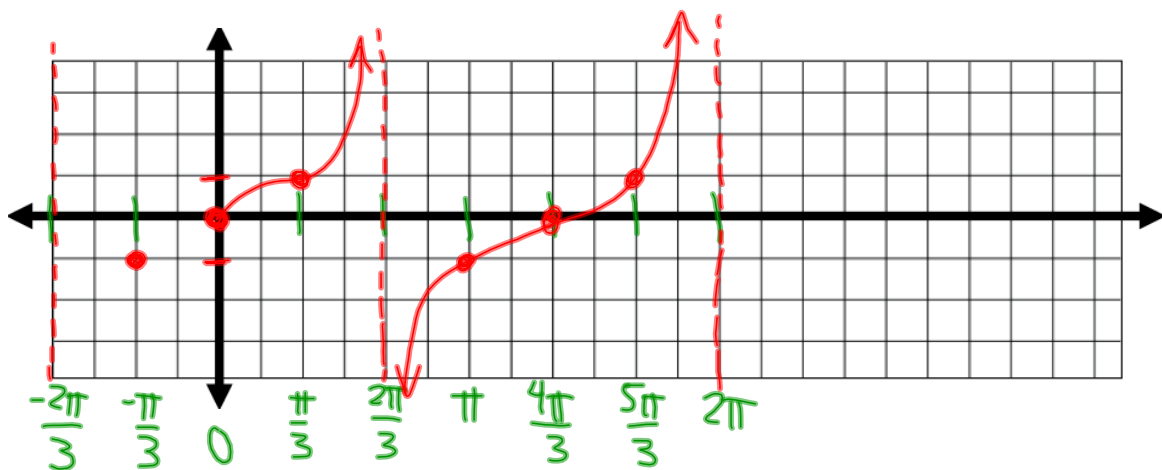


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Ex.3 Graph from 0 to 2pi of the following.

$$y = \tan \frac{3}{4} \theta$$

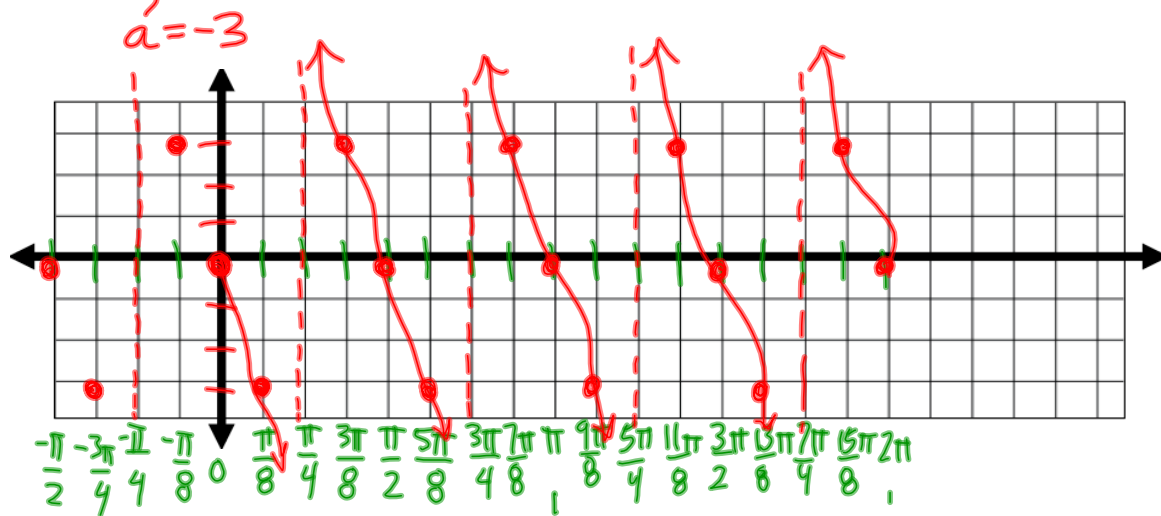
Period: $\frac{\pi}{b} = \frac{\pi}{\frac{3}{4}} = \frac{4\pi}{3} \cdot \frac{1}{4} = \frac{\pi}{3}$



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Ex.4 Graph from 0 to 2π of the following.

$$y = -3 \tan 2\theta \quad \text{Period: } \frac{\pi}{6} = \frac{\pi}{2} \cdot \frac{1}{4} = \frac{\pi}{8}$$



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HW:

P. 872:

8 - 15 all, 18 - 25 all, 30, 52 - 55 all

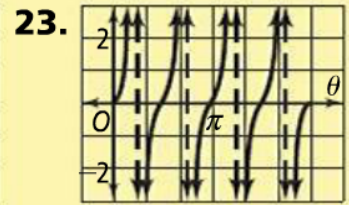
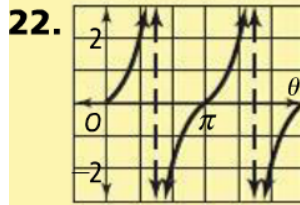
** 24 and 30 just graph two cycles*

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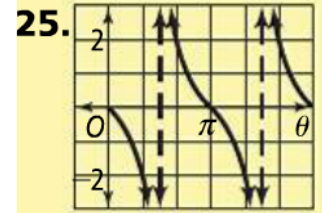
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- 8.** 0
- 10.** -1
- 12.** 1
- 14.** 1
- 9.** 0
- 11.** undefined
- 13.** 0
- 15.** undefined

- 18.** $\frac{\pi}{5}; \theta = -\frac{\pi}{10}$ and $\theta = \frac{\pi}{10}$
- 19.** $\frac{2\pi}{3}; \theta = -\frac{\pi}{3}$ and $\theta = \frac{\pi}{3}$
- 20.** $\frac{\pi}{4}; \theta = -\frac{\pi}{8}$ and $\theta = \frac{\pi}{8}$
- 21.** $\frac{3\pi^2}{2}; \theta = -\frac{3\pi^2}{4}$ and $\theta = \frac{3\pi^2}{4}$



- 52.** C
- 53.** H
- 54.** B
- 55.** I



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