5.3 The Tangent Function

The value of the tangent of an angle θ is the slope of the line passing through the origin and the point on the unit circle (cos θ, sin θ). You can think of it as the slope of the terminal arm of angle θ in standard position.

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

Example 1

Graph the Tangent Function

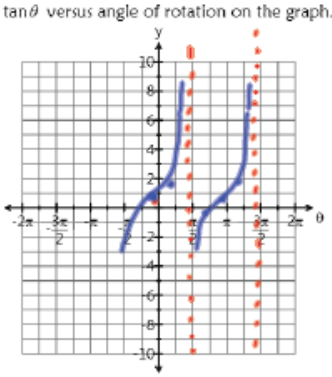
Graph the function $y = \tan\theta$ for $-2\pi \le \theta \le 2\pi$. Describe its characteristics.

Solution

1. Determine the *exact* values for $\tan\theta$.

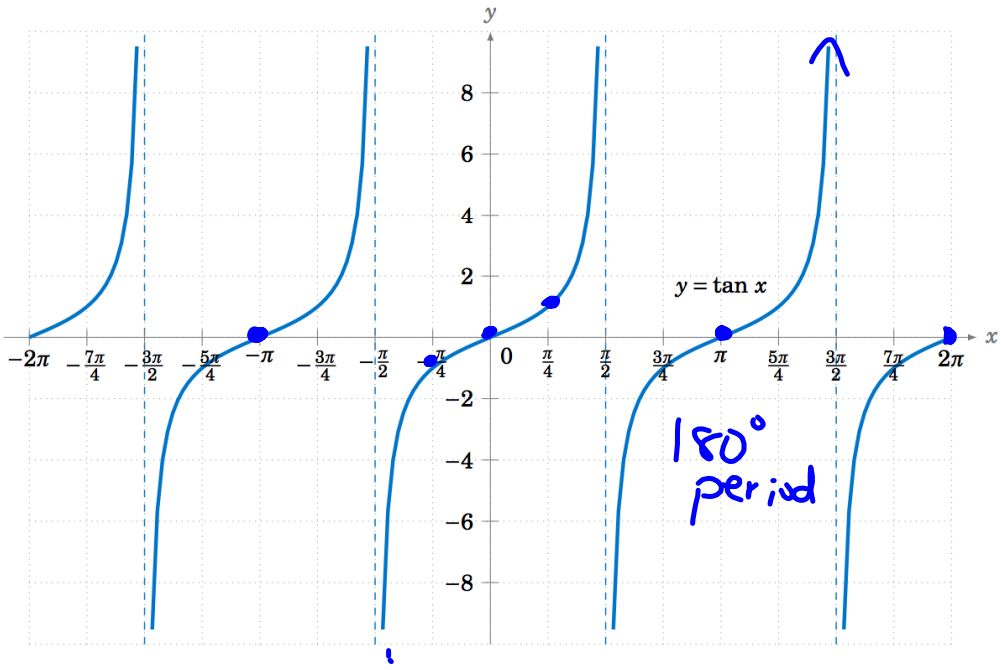
θ	$-\frac{5\pi}{4}$	$-\pi$	$-\frac{3\pi}{4}$	$-\frac{2\pi}{3}$	$-\frac{\pi}{2}$	$-\frac{\pi}{3}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{7\pi}{4}$	2π
$\tan\theta$								0	1	$\sqrt{3}$	und	$-\sqrt{3}$	-1	0	1	$\sqrt{3}$	und			

2. Use the table above to draw a graph of $\tan\theta$ versus angle of rotation on the graph.



3. Summarize the following characteristics of the function $y = \tan\theta$.

Max value	none
Min value	none
Amplitude	π
Period	$0 + \pi n, n \in I$
Zeros, $\theta \in [-2\pi, 2\pi]$	0
the y-intercept	$x / x \neq \frac{\pi}{2} + \pi n, n \in I$
Domain	$y \in R$
Range	


y
x
8
6
4
2
−2
−4
−6
−8
-2π
$-\frac{7\pi}{4}$
$-\frac{3\pi}{2}$
$-\frac{5\pi}{4}$
$-\pi$
$-\frac{3\pi}{4}$
$-\frac{\pi}{2}$
$-\frac{\pi}{4}$
0
$\frac{\pi}{4}$
$\frac{\pi}{2}$
$\frac{3\pi}{4}$
π
$\frac{5\pi}{4}$
$\frac{3\pi}{2}$
$\frac{7\pi}{4}$
2π
$y = \tan x$
180°
period