AAT Name _____

4-6 The Tangent Function and Periodicity Date _____ **A#11**

Goal: Graph and analyze the function tangent: $\theta \longrightarrow \tan\theta$. Discuss the periodicity of the 3 basic trig functions.

Questions

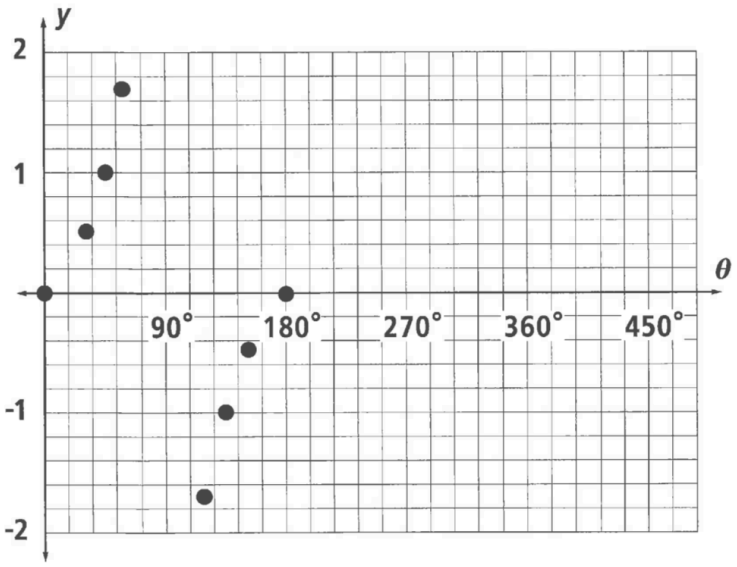
Activity:

1. The table below contains some of the values of $\tan\theta$. Complete the table using a unit circle and a calculator.

θ	0	$30° = \frac{\pi}{6}$	$45° = \frac{\pi}{4}$	$60° = \frac{\pi}{3}$	$90° = \frac{\pi}{2}$	$120° = \frac{2\pi}{3}$	$135° = \frac{3\pi}{4}$	$150° = \frac{5\pi}{6}$	$180° = \pi$
$\tan\theta$ (exact)	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	undefined				0
$\tan\theta$ (approx.)	0	0.577	1	1.732	undefined				0

θ	$210° = \frac{7\pi}{6}$	$225° = \frac{5\pi}{4}$	$240° = \frac{4\pi}{3}$	$270° = \frac{3\pi}{2}$	$300° = \frac{5\pi}{3}$	$315° = \frac{7\pi}{4}$	$330° = \frac{11\pi}{6}$	$360° = 2\pi$
$\tan\theta$ (exact)								
$\tan\theta$ (approx.)								

2. Plot the remaining points from the table above. Draw a smooth curve through these points.



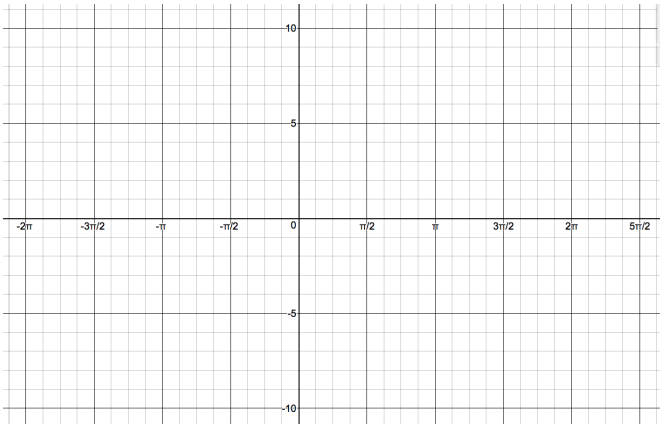
3. Check your graph using a graphing calculator: $y = \tan x$.

The graph of tangent looks a bit like _____.

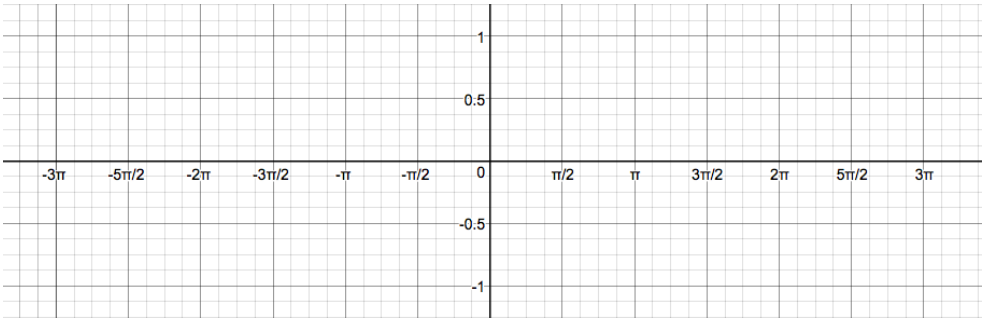
Questions

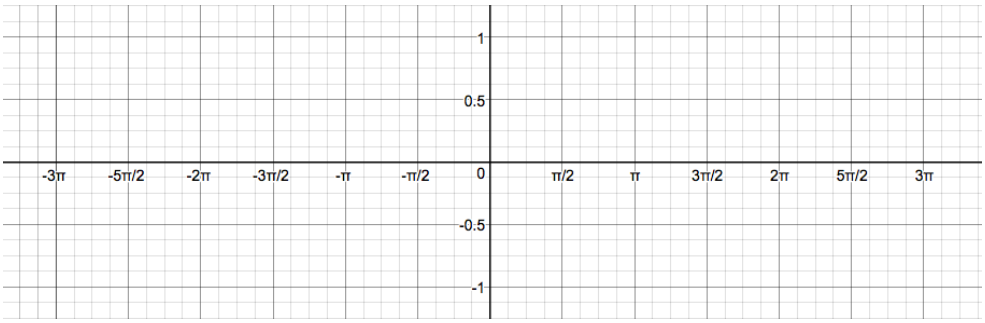
Shortcut to Graphing Tangent Function

1. Draw asymptotes at _____
2. Plot zeros at _____
3. Sketch smooth curves



Quick sketch: In the planes below, graph the sine function then the cosine function.





Periodicity and Trig Functions

Many phenomena in real life are periodic (repeating). For example, _____
_____

Periodicity Theorem

For any real number x and any integer n,

$$\sin x = \sin(x + n \cdot 2\pi) = \sin(x + n \cdot 360^\circ)$$
$$\cos x = \cos(x + n \cdot 2\pi) = \cos(x + n \cdot 360^\circ)$$
$$\tan x = \tan(x + n \cdot \pi) = \tan(x + n \cdot 180^\circ).$$

The Periodicity Theorem can be summarized as _____
_____ .

The **period** is the positive number _____ such that $f(x+p)=f(x)$. The periods of the trigonometric functions are _____.

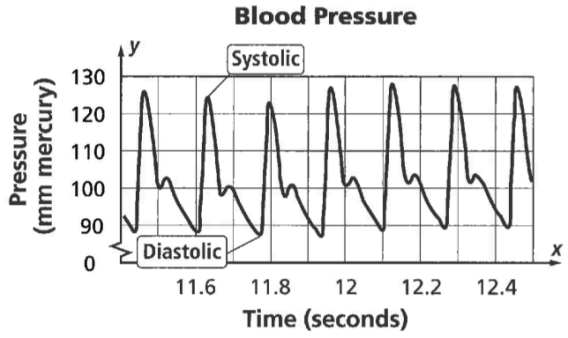
Example 1: Use the Periodicity Theorem to find $\cos 2670^\circ$.

Example 2: Use the Periodicity Theorem to find $\sin 15780^\circ$.

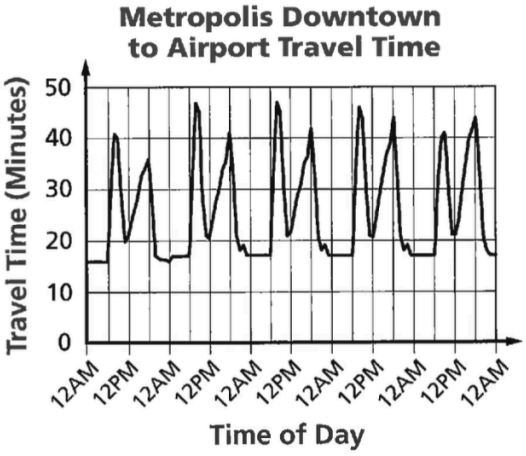
Questions

Questions

Example 3: The graph below shows normal human blood pressure as a function of time. Blood pressure is *systolic* when the heart is contracting and *diastolic* when the heart is expanding. The changes from systolic to diastolic blood pressure create pulse. For this function, determine each. Find (a) the max and min values, (b) the range and (c) the period.



Example 4: The graph below shows the average travel time from downtown Metropolis to Metropolis Int'l Airport during a typical work week. For this function, Find (a) the max and min values, (b) the range and (c) the period.



Summary: