

## Project 2: Graph of Tangent

Read the directions carefully! Points will be deducted for missing parts. Write your group members' names on this page. This project is worth 36 points.

We're going to make a graph of the tangent function. This time, we'll measure the angles in radians.

Start by filling out the table, with inputs every  $\frac{\pi}{12}$  radians (or  $15^\circ$ ). Use your calculator to get the numbers. Round numbers to the nearest hundredth if necessary.

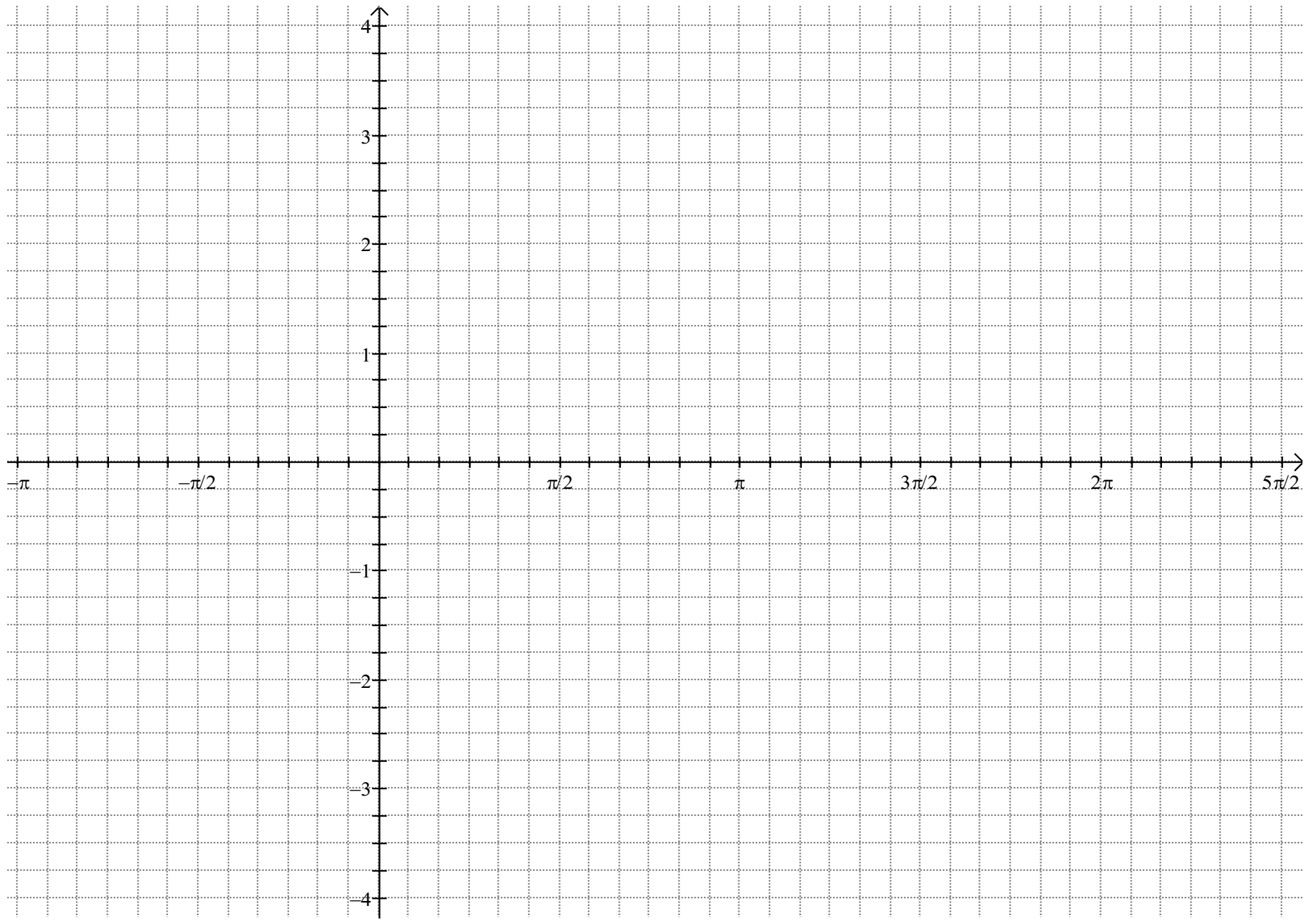
On page 3, graph a point for every  $\frac{\pi}{12}$  radians, and then use those points to complete your tangent graph. Make sure to graph all the way from the left edge to the right edge of the page. (That means you'll need to identify the pattern that shows up in the values you've actually calculated, and continue it.)

**Notice that tangent has vertical asymptotes. Use dotted lines on your graph to show them.**

$\theta$ (in degrees)	$\theta$ (in radians)	$\tan(\theta)$ (in decimal form)
$0^\circ$	0	0
$15^\circ$	$\frac{\pi}{12}$	
$30^\circ$	$\frac{2\pi}{12} = \frac{\pi}{6}$	
$45^\circ$	$\frac{3\pi}{12} = \frac{\pi}{4}$	1
$60^\circ$	$\frac{4\pi}{12} = \frac{\pi}{3}$	
	$\frac{5\pi}{12}$	
	$\frac{6\pi}{12} = \frac{\pi}{2}$	undefined

$\theta$ (in degrees)	$\theta$ (in radians)	$\tan(\theta)$ (in decimal form)
	$\frac{13\pi}{12}$	

Note, the boxes along the x-axis on the graph paper on the next page are of length  $\pi/12$ .



**After you've finished the graphs, answer the following questions. All angle measure should be in radians, and when you are asked to explain, you should do so with one or more complete sentences.**

**(1)** When is  $\tan(\theta) = 0$ ? **Show the answer three different ways:** by sketching the unit circle and showing the angles, by writing a list of the angles (at least 5 consecutive), and by writing a formula for the angles.

Using what you know about sine and cosine, explain why tangent equals 0 at those angles.

**(2)** When is  $\tan(\theta)$  undefined? Show the answer three different ways: by sketching the unit circle and showing the angles, by writing a list of the angles (at least 5 consecutive), and by writing a formula for the angles.

Using what you know about sine and cosine, explain why tangent is undefined at those angles.

**(3)** What is the period of  $\tan(\theta)$ ? That is, how often does it repeat itself?

Why is it different from the periods of sine and cosine?