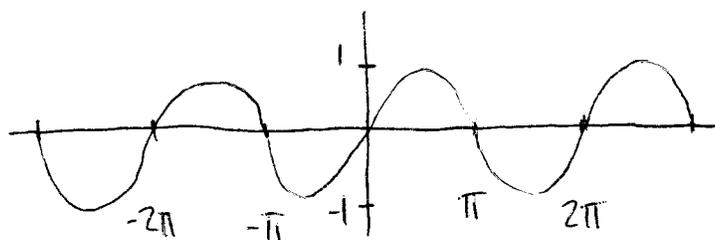


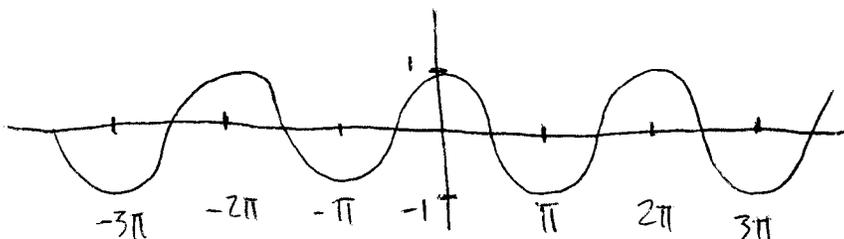
Math Xb Spring 2004
 Worksheet: Tangent, Angles, and Arc Length
 March 3, 2004

1. (a) Sketch the graph of $y = \sin x$ and determine all x -values for which $\sin x = 0$.



$\sin x = 0$
 for $x = \pi n$,
 n an integer

- (b) Sketch the graph of $y = \cos x$ and determine all x -values for which $\cos x = 0$.



$\cos x = 0$
 for $x = \pi n + \pi/2$,
 n an integer

- (c) Use your answer to part (a) and the fact that $\tan x = \frac{\sin x}{\cos x}$ to determine the zeros of the tangent function.

Zeros of tangent func = zeros of sin func
 $= \pi \cdot n$

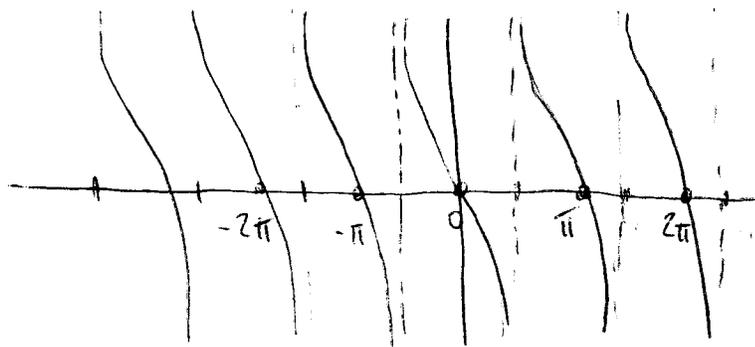
- (d) Use your answer to part (b) and the fact that $\tan x = \frac{\sin x}{\cos x}$ to determine vertical asymptotes of the tangent function.

vert. asymptotes = zeros of cos func = $\pi n + \pi/2$

- (e) Use your answers to parts (a) and (b) and the fact that $\tan x = \frac{\sin x}{\cos x}$ to the intervals on which the tangent function is positive and the intervals on which it is negative.

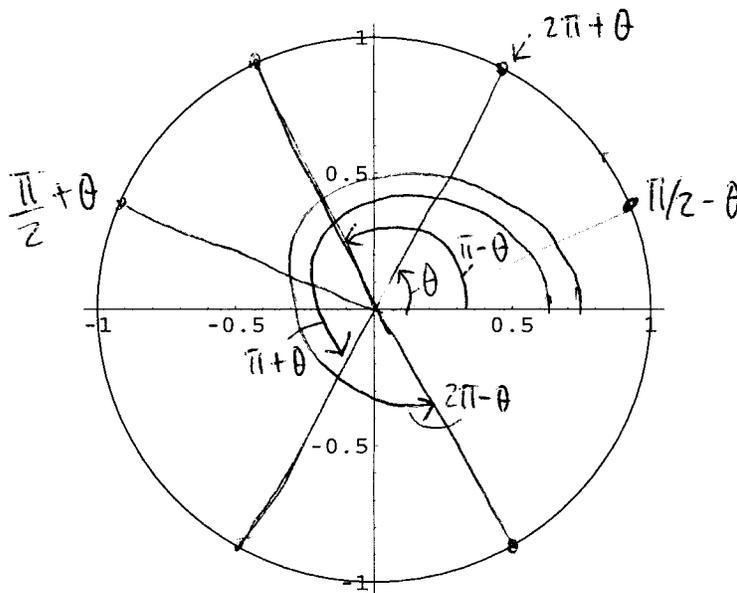
for n an integer,
 $0 + 2\pi n < x < \frac{\pi}{2} + 2\pi n \leftarrow \tan \text{ positive} \rightarrow \pi + 2\pi n < x < \frac{3\pi}{2} + 2\pi n$
 $\frac{\pi}{2} + 2\pi n < x < \pi + 2\pi n \leftarrow \tan \text{ neg} \rightarrow \frac{3\pi}{2} + 2\pi n < x < 2\pi + 2\pi n$

- (f) Use your answers to parts (c), (d), and (e) to sketch the graph of $y = \tan x$.



2. Suppose that an angle measuring θ radians in standard position intersects the unit circle at the point $(\frac{5}{13}, \frac{12}{13})$. Label each of the following angles on the unit circle below. Use symmetry to help you.

- (a) θ
- (b) $\pi - \theta$
- (c) $\pi + \theta$
- (d) $2\pi - \theta$
- (e) $2\pi + \theta$
- (f) $\frac{\pi}{2} - \theta$
- (g) $\frac{\pi}{2} + \theta$



3. Given the angle θ from the previous question, find each of the following trig values. Use symmetry to help you.

- (a) $\sin \theta = \frac{12}{13}$
- (b) $\cos(\pi - \theta) = -5/13$
- (c) $\tan(\pi + \theta) = 12/5$
- (d) $\sin(2\pi - \theta) = -12/13$
- (e) $\cos(2\pi + \theta) = 5/13$
- (f) $\tan(\frac{\pi}{2} - \theta) = 5/12$
- (g) $\sin(\frac{\pi}{2} + \theta) = 5/13$