Worksheet # 11: Trigonometric Functions

1. Convert the angle $\pi/12$ to degrees and the angle 900° to radians.

2. Find the exact values of the following expressions. Do not use a calculator.

   (a) $\arctan(1)$

   (b) $\tan(\arctan(10))$

   (c) $\arcsin(\sin(7\pi/3))$

3. Find all solutions to the following equations in the interval $[0, 2\pi]$. You will need to use some trigonometric identities.

   (a) $\sqrt{3}\cos x + 2\tan x \cos^2 x = 0$

   (b) $3\cot^2(x) = 1$

   (c) $2\cos x + \sin 2x = 0$

4. If $\sin(x) = \dfrac{2}{5}$ and $\sec(x) = \dfrac{-5}{3}$, find $\csc(x), \cot(x), \cos(x), \tan(x), \sin(2x)$.

5. Find the length of the circular arc subtended by an angle of $\pi/12$ rad if the radius of the circle is 36 cm.

6. A clock lies in the coordinate plane so that its center is at the origin. The hour hand is 5 cm long and the minute hand is 15 cm long. Find the coordinates of the tips of each hand at 3 : 50 pm.

7. Differentiate each of the following functions:

   (a) $f(t) = \cos(t)$

   (b) $g(u) = \dfrac{1}{\cos(u)}$

   (c) $r(\theta) = \theta^3 \sin(\theta)$

   (d) $s(t) = \tan(t) + \csc(t)$

   (e) $h(x) = \sin(x)\csc(x)$

   (f) $f(x) = x^2 \sin^2(x)$

8. A particle's distance from the origin (in meters) along the x-axis is modeled by $p(t) = 2\sin(t) - \cos(t)$, where t is measured in seconds.

   (a) Determine the particle's speed (speed=|velocity|) at π seconds.

   (b) Is the particle moving towards or away from the origin at π seconds. Explain.

   (c) Now, find the velocity of the particle at time $t = 3\pi/2$. Is the particle moving towards the origin or away from the origin?