Trig: Equation Solving

Section 2.3

8 October 2013

Instructions: Read the problems carefully, then solve. If you don't have a calculator, leave your answer in an appropriate exact form.

Please work together and feel free to ask questions.

1. Solve the equations.

a. $\sqrt{3}\csc(x) - 2 = 0$

b. $2\sin^2(2x) = 1$

c. $2\cos(2x) - 1 = 0$

d. $\sin(x)\big(\sin(x) + 1\big) = 0$

2. Find all solutions in the interval $[0, 2\pi)$.

a. $\cos^3(x) = \cos(x)$

b. $2\sin^2(x) + 3\sin(x) + 1 = 0$

c. $2\sin(x) + \csc(x) = 0$

d. $\sec(x) + \tan(x) = 1$

e. $\cos(x) + \sin(x)\tan(x) = 2$

3. A baseball is hit at an angle of θ with the horizontal and with an initial velocity of $v_0 = 100$ feet per second. An outfielder catches the ball 300 feet from home plate. If the range of a projectile is modeled by the equation

$$r = \frac{1}{32} v_0^2 \sin(2\theta),$$

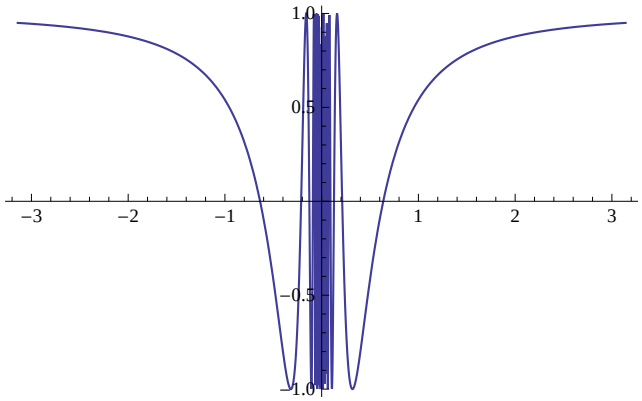
find θ.

4. The area of a rectangle inscribed in one arc of the graph $y = \cos(x)$ is given by

$$A = 2x\cos(x), \quad 0 < x < \frac{\pi}{2}.$$

(Do you believe it?) Use a computer or graphing calculator to graph the area function $y = A(x)$. Try to approximate the area of the largest possible inscribed rectangle. Determine the values of x such that $A(x) \geq 1$.

5. Consider the function $y = \cos(\frac{1}{x})$, and its graph shown below.



This curve is called the *topologist's cosine curve*. What is the domain of the function? Describe any symmetry and asymptotes of the graph. How does the graph behave as x approaches 0? How many solutions does the equation $\cos(\frac{1}{x}) = 1$ have in the interval $[-1, 1]$? Does the equation $\cos(\frac{1}{x}) = 0$ have a greatest solution? If so, find it. If not, why?