Name _____

Homework 5
Sections 1.5

1. (5) Find an exact solution in the interval $[3\pi, 4\pi]$ to the following equation:

$$3 = 8\cos(2x + 1) + 7$$

2. (2,4) A population of crickets oscillates sinusoidally over the course of one year between a low of 500 on April 1 and a high of 30,500 on October 1.

   (a) Sketch a graph of the cricket population against time, where $t = 0$ corresponds to January 1.

   (b) Determine a function of the form $P(t) = A\sin(Bt) + C$ which models the cricket population, where t is months since the beginning of the year.

3. (2ea) Simplify the following expressions (as algebraic expressions):

   (a) $\tan\left(\cos^{-1}(2t)\right)$ (b) $\cos\left(\sin^{-1}(\sqrt{x})\right)$

4. (5) An art critic wishes to view a 6 foot tall painting which is hung so that the bottom is 7 feet above the ground. The critic knows that her best view of the painting will occur when the angle (θ) between her line of sight to the bottom of the painting and her line of sight to the top of the painting is at a maximum. Express the angle θ in terms of her distance from the wall d, given that her eye level is 5 feet above the ground.

   Hint: express θ as $\beta - \alpha$ with β and α in terms of distance from the wall.