**Exam 3   Algebra & Trig   11/11/2003**

Each problem is worth 10 points. Show adequate justification for full credit. Please circle all answers and keep your work as legible as possible.

1. Evaluate $\ln \dfrac{1}{e^7}$ exactly.

2. On the unit circle shown below, mark the points corresponding to angles of 300°, 315°, and 330° (measured counterclockwise from the positive x axis) and label these points with their exact x and y coordinates.
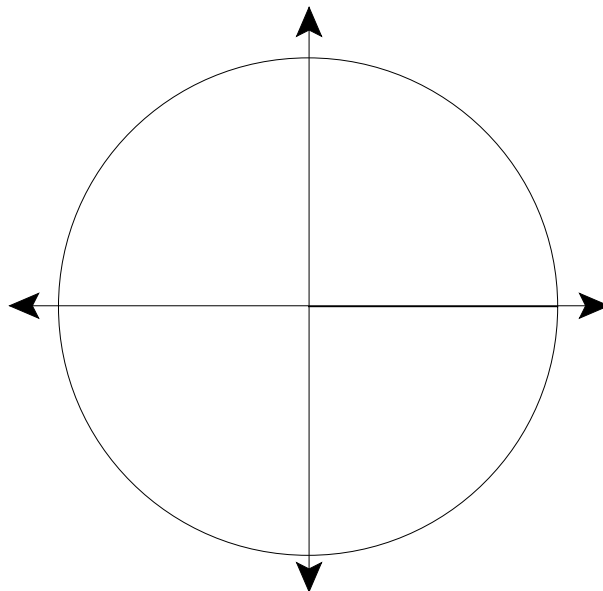
3. Solve the equation ln $x = 3$ exactly.

4. If θ is a second-quadrant angle for which sin $\theta = 4/5$, give exact values for the other five trig functions of θ.

5. Find a possible formula for the graph shown:
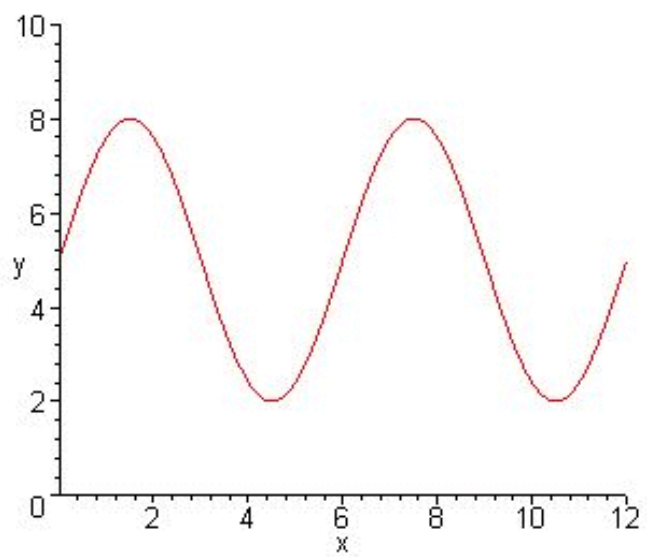
6. In the middle of the night an airplane comes in to land at the Cedar Rapids airport. The plane is 2000 feet above Jon's house, which is 3000 feet from the airport (and the ground between Jon's house and the airport is pretty much level). The plane is really loud, so it wakes Jon up, and he lays there awake thinking about it. What is the angle between the horizontal ground and the airplane, as seen from the airport?

7. Biff is having some trouble with logs. He says "So I screwed up this thing on my math test, and the tutor my parents are paying for couldn't really explain it to me. I did something and got a negative number for it, and then I was supposed to do the log of that, and my calculator I guess can't do those. And so I asked the tutor, and she said you just can't do logs of negatives. But that's crazy, right, because it's gotta be something. So what's up with logs of negatives?"

Explain clearly to Biff either how to do the log of a negative number, or why it's not possible to do so.

8. Kim manages to convince a really stupid bank that it'll be okay to give her a really nice interest rate of 24%, compounded monthly, as long as she only deposits $100 in the account. How much money will Kim have in the account if she leaves it there for 30 years?

9. Simplify $\tan(\cos^{-1} x)$.

10. Suppose that a water filtration system will remove 80% of the contaminants in a gallon of water during each 10 hour period. How much longer will it take the system to remove 99% of the contaminants than it takes to remove 95% of the contaminants?

Extra Credit (5 points possible):

If a right triangle has a base of length b and an angle adjacent to it of measure θ, what is the area of the triangle?