

**Practice Exam 3   Algebra & Trig   4/22/2003**

Each problem is worth 10 points. For full credit provide complete justification for your answers.

1. Convert  $40^\circ$  to an equivalent exact radian measure.

2. Find  $\log_2 32$  exactly.

3. If  $\theta$  is a fourth-quadrant angle such that  $\cos \theta = 1/5$ , find exact values for the other 5 trig functions of  $\theta$ .

4. Sketch at least two complete periods of the graph of  $y = 5\cos(6x - \pi) + 10$ .

5. Solve (exactly) the equation  $\ln 3 - \ln (x + 2) = \ln x$ .

6. An office worker with a really boring job is staring out his boss's window (office workers with really boring jobs don't have windows of their own). He measures the angle made between the vertical side of his tall office building and a hotdog vendor's stand across the street to be  $15^\circ$ , and then at lunchtime goes out and measures that the distance between the base of the building below his boss's window and the hotdog vendor's stand is 40 feet. Find, to the nearest foot, the height of his boss's window.

7. Simplify  $\sec(\sin^{-1} x)$ .

8. Paul is a Precalc student at Enormous State University, and he's having some trouble with trigonometry. He says "I just so totally don't get all this stuff about trig functions. I figured I could pretty much just know nothing since my calculator does it all, but I totally crashed and burned on the test, and now the professor is saying since everybody else did bad too he's probably gonna put that on the final too. There was this problem with, like, the tangent of three pi over two, so I did it on my calculator, and I took 3.14 for pi, and times three and divided by 2, then I did the tangent of that. So I got, like, four hundred something, and I got totally no credit for it, and the professor was going off when he handed back the tests about how we just hit buttons and don't understand anything. But I figure the calculator's gotta be right, doesn't it? So I've got no idea what went wrong, or how I'm supposed to do it now."

Explain clearly to Paul what went wrong with his approach, and how he should deal with a problem like this.

9. If  $f(x) = 20 + 70e^{-x/50}$ , find  $f'(x)$ .

10. If the population of the world is 5 billion people today, and grows at a rate of 4% per year, how long will it be until the population is 6 billion people? (Approximate your answer to 2 decimal places)

Extra Credit (5 points possible): A circle with a radius of 10 fits inside an equilateral triangle so that it just touches all three sides of the triangle. What is the exact area of the triangle?