Discussion Problems for Math 180

Tuesday, September 30, 3014

Remember to include units in answers where appropriate!

1. Have you reviewed trigonometry?

   - Express $\sin(\alpha + \beta)$ in terms of the sine and cosine of α and β.
   - What are the sine and cosine of 0, $\dfrac{\pi}{6}$, $\dfrac{\pi}{4}$, $\dfrac{\pi}{3}$, and $\dfrac{\pi}{2}$? (Make a table.)
   - What is $\sin\left(\dfrac{5\pi}{12}\right)$?

2. Suppose you want to start a business selling muffins. The total cost, in dollars, to produce n muffins is given by $C = \$7,224 + \$0.05n$.

   (a) What is the average cost per muffin if you produce a thousand muffins?
   (b) ...if you produce a million?
   (c) What is the marginal cost of the thousandth muffin?
   (d) ...the millionth?
   (e) If people are willing to pay \$3.49 per muffin, how many would you have to sell to break even?

3. What is the derivative of $f(x) = \sin^8(x)$?

4. What is the derivative of $g(x) = \sqrt{1 + x^2}$?

5. Find the derivative of $h(x) = (1 + x)^4$ in two different ways – by multiplying it out first and by using the chain rule – and demonstrate that you get the same answer both ways.

6. On the rare occasions I have to deal with particularly troublesome students, I scale the outside of University Hall (which is 336 feet tall) with a backpack full of water balloons and wait for the trouble-maker to pass underneath. From basic physics, we know that after t seconds the height, in feet, of an object dropped from that height is given by $h(t) = 336 - 16t^2$.

   (a) When releasing a balloon, I need to compensate for the time it takes to get to the ground. How long would that be, exactly?
   (b) How fast will the balloon be moving when it hits the ground?