Fake Exam 4 Calc 1 11/14/2018

Each problem is worth 0 points. For full credit learn enough to do well on the real exam.

1. Find the maximum value of $f(x) = 5x - x^2$.

2. Find the maximum value of $f(x) = 5x - x^2$ on $[0,10]$.

3. Find the largest interval on which $f(x) = x\,e^{-x}$ is increasing.

4. Find the largest interval on which $f(x) = x\,e^{-x}$ is concave up.

5. Find **all** local maxima of $f(x) = \sin x + \cos x$.

6. Find the largest interval on which $f(x) = 3x^3 - 2x^2 + x - 7$ is decreasing.

7. Use Newton's method to calculate x_1, and x_2 for $\sqrt[3]{15}$ with $x_0 = 2$ as the initial approximation.

8. Squares with sides of length x are cut out of each corner of a rectangular sheet of metal measuring 6 ft by 4 ft. The resulting piece of cardboard is then folded into a box without a lid. The box is to be used as a container for mutant super piranhas, so it's only being filled to a level 6 inches below the brim to prevent escape. Find the largest volume of water that can be contained in such a box.

9. Find the intervals on which the graph of $y = e^{-x^2/2}$ is concave up.

10. Economists use terminology closely related to ours, so if $R(x)$ is a function that tells the revenue generated by selling x units, then they call the function $R'(x)$ the **marginal revenue function.** Similarly if $C(x)$ is a function that tells the cost to the company of producing x units, then they call the function $C'(x)$ the **marginal cost function.** They also get really excited about $P(x) = R(x) - C(x)$, the **profit** generated when selling x units.

    Show that profit is maximized when marginal cost is equal to marginal revenue.