Midterm 2 Practice Midterm

1 True/False

For each of the following questions respond true if the statement is true and false if the statement is false. If your response is false give a counter example or explain why.

1. Max/Min values of a function occur at critical points of the function.

2. Max/Min values occur at inflection points of a function.

3. The First Derivative test can be used for any type of internal critical point.

4. The First/Second Derivative test are used to find global max/min values of a function.

5. The initial guess for Newton's method doesn't need to be close to the root it is trying to find.

6. The derivative of the antiderivative of f(x) is equal to f(x).

2 Free response

1. Find the linear approximation of the function $f(x) = sin(4x) + 2x^2$ at the point $x = \frac{\pi}{2}$

2. Find the global maximum and minimum values of the function $g(x) = 2x^3 + 3x^2 - 4x + 4$ on the interval $I = (-1, 2]$

3. Find the regions of increasing/decreasing for the function $h(x) = \frac{x-1}{x}$

4. Find the inflection points and regions of concave up/down for the function $f(x) = x^4 + 8x^3 - 2$

For problems 5,6 use an appropriate derivative test:

5. Identify all critical points and determine the local mins/maxs for the function $g(x) = \frac{1}{2}x + sin(x)$ on the interval $I = (0, 2\pi)$

6. Identify all critical points and determine the local mins/maxs for the function $h(x) = \frac{x}{x^2+4}$

7. Suppose that a farmer has 9 meters of fencing and wants to make 4 identical animal pens by starting with a rectangular pen and subdividing it into equal quarters. What is the maximum volume of the 4 pens if the farmer uses up all 90 meters of fencing.

8. A different farmer wants to enclose a single rectangular pen of 400 square meters of area. Due to the winds the east-west sides of the fence have to be built with heavy fencing costing 5 dollars per meter, while the north-south sides can be built of light fencing costing only 2 dollars per meter. What dimensions should the farmer use to minimize the cost of the fence. In other words if we call the east-west fence length w and the north-south fence length l then what are w and l that minimize the cost.

9a. For the function $f(x) = \frac{3x^5 - 20x^3}{32}$ find the x,y-intercepts

9b. Find all critical points of f(x) and where the function is increasing/decreasing

9c. Find any local minima/maxima

9d. Find any inflection points of f(x) and where f is concave up/down

9e. Using this information graph f(x)

10. Find the antiderivative of $g(x) = 4x^2 + 3x + 2$

11. Find the antiderivative of $h(x) = sin(x) - cos(x) + sec(x)tan(x)$