

Name: _____

Practice Test 2 for Test 3 for MTH151I-L

1. Estimate the value of $\sqrt[3]{63}$ using differentials. Remember that it is not enough to find dy .

2. Find the intervals on which the given function is increasing and decreasing. Determine where the function has local maxima and minima.

$$f(x) = x^2 e^{-x}.$$

3. Find the intervals on which the given function f is increasing and decreasing, the intervals on which f is concave up and down, and any points of inflection. Find the local maxima and minima.

$$f(x) = x^3 - 7x + 6.$$

4. Show that $x^3 - 9x + 1 = 0$ has exactly one solution in the interval $[2, 3]$. (Hint: this problem has two parts, and uses two different theorems of calculus. First you have to show that there is a root. Second, you have to show that there can't be two or more roots. If there are at least two roots, what does this imply? Which theorem tells you this? What can you conclude?)

5. Evaluate the limit: $\lim_{x \rightarrow 0} \frac{\sin(2x) - 2x}{x^3}$.

6. Evaluate the limit: $\lim_{x \rightarrow 0^+} (\cot x)^{\sin x}$.

7. If 1200 square centimeters of material are available to make a box with a square base and an open top, find the largest possible volume of the box.

8. A farmer wants to fence in a rectangular field of total area 2,000,000 square feet next to a river. The bank of the river forms one side of the rectangular field (the bank is perfectly straight ...), and the side next to the river doesn't need to be fenced. Find the dimensions of the field that will need the smallest amount of fencing.

9. Suppose $f''(x) = 2 - 12x$, $f(0) = 9$, and $f(2) = 15$. Find $f(x)$.

10. What constant acceleration is required to increase the speed of a car from 45 feet per second to 75 feet per second in 5 seconds?