

Test Total

Name _____

Sample Test 3 Calculus I 3450:221 Dr. Norfolk

Show all of your work.

1. Suppose that $f'(x) = \frac{(5-x)}{(9-x^2)^{2/3}}$, and that $f(x)$ is continuous on $[0, 6]$.

(a) Find any *critical points* of $f(x)$ on $[0, 6]$.

5 points

(b) Explain why the *absolute maximum* of $f(x)$ on $[0, 6]$ *must* occur at $x = 5$.

5 points

2. Suppose that $f(x)$ is differentiable and that $f'(x) < -1$ for all x .

Given that $f(3) = 5$, what does the *Mean Value Theorem* tell you about $f(1)$?

5 points

3. We construct a *rectangular* box with *square ends*. The total material used for the 6 faces is 24 square inches. Find the maximum possible volume.

15 points

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4. Sketch the graph of $y = f(x)$ given the following information.

- $f(0) = 2; f(1) = 1; f(2) = 0; f(3) = 1.$
- $\lim_{x \rightarrow -1^-} f(x) = +\infty; \lim_{x \rightarrow -1^+} f(x) = +\infty; \lim_{x \rightarrow -\infty} f(x) = 0; \lim_{x \rightarrow \infty} f(x) = 2.$

• The sign graph of $f'(x)$:

+	<i>NO</i>	-	0	-	-	0	+	+
-1	0	1	2	3				

• The sign graph of $f''(x)$:

+	<i>NO</i>	+	0	-	0	+	+	0	-
-1	0	1	2	3					

10 points

5. We wish to use *Newton's Method* to solve $x^4 = 4x + 1.$

Why would we not use $x_0 = 1$ as our *initial guess*?

5 points

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6. Given

$$y = \frac{x^2 - 1}{(x - 2)^2}, \quad y' = \frac{-2(2x - 1)}{(x - 2)^3}, \quad y'' = \frac{2(4x + 1)}{(x - 2)^4}$$

(a) Find any *intercepts* on the graph of y .

5 points

(b) Find any *vertical, horizontal or slant asymptotes* of y , and compute the appropriate limits.

5 points

(c) Find the intervals on which y *increases*, and those on which it *decreases*.

5 points

(d) Find both coordinates of any *local extrema* of y .

5 points

(e) Find the intervals on which y is *concave up*, and those on which it is *concave down*. Identify any *points of inflection*.

5 points

(f) Use the information derived to sketch the graph of y .

5 points

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