

NAME _____

I____ II____ III____ IV____ V____ VI____ VII____ VIII____ IX____ X____ TOTAL _____

October 5
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Mathematics 105
Calculus I
Examination #1

Mr. Haines

(5) I. Suppose the function f has rule

$$f(x) = \begin{cases} 4 & \text{if } x < -2 \\ 0 & \text{if } -2 \leq x < 2 \\ 3 & \text{if } 2 \leq x \end{cases}$$

Prove that f is not an even function by substituting specific values for x .

(10) II. Graph $f(x) = \ln x$ on your calculator.

A. Explain how you know from the graph of f that the graph of f' is above the x-axis.

B. Explain how you know from the graph of f that the graph of f'' is below the x-axis.

(5) III. Suppose $f(0.8) = 4$, $f(1.2) = 20$, and $f(2.6) = 7$. Use this information to give a number that estimates $f'(1.0)$:

(15) IV. Sketch below a graph of any function f whose graph contains the three separate points $(1, 1)$, $(3, 3)$, and $(5, 5)$ and has all three of these properties:

A. f is not continuous at $x = 5$.

B. f does not have a limit at $x = 1$.

C. 3 is a stationary point but is not a local maximum or local minimum for f .

(10) V. If possible, graph two distinct solutions to the differential equation $y' = 5$. If not possible, explain why not.

(12) VI. If $f(x) = x^3 + x + 4$

A. The formula for $f'(x)$ is: _____

B. The formula for $f''(x)$ is: _____

C. $\lim_{h \rightarrow 0} \frac{f(4+h) - f(4)}{h} =$ _____

D. $\lim_{x \rightarrow 10} \frac{f'(x) - f'(10)}{x - 10} =$ _____

(8) VII. If $f(x) = \frac{x}{x}$, evaluate the following if they exist. If not, say why not.

A. $f(-2) =$ _____

B. $f(0) =$ _____

C. $\lim_{x \rightarrow 0} f(x) =$ _____

D. Is f continuous at $x = 0$? Why or why not?

(15) VIII. Suppose $f'(x) = (x - 1)(x - 2) = x^2 - 3x + 2$.

A. Find all the stationary points of f .

B. If $f(0) = 0$ give a formula for $f(x)$.

C. Find all of the local maximum values of f on the interval $[0,4]$.

D. Find all of the local minimum values of f on the interval $[0,4]$.

E. Give the intervals where f is decreasing.

(10) IX. If $f(t) = 15t^2 + 10t + 3$ then

A. $f'(t) =$ _____

B. Give the equation of the tangent line to the graph of $y = f'(t)$ at the point $(1, f'(1))$.

(10) X. Suppose $f''(x) = 6$ for all numbers x . Give a formula for $f(x)$ if you know that $f(1) = 2$ and $f'(2) = 4$.