

NAME _____

I ___ II ___ III ___ IV ___ V ___ VI ___ VII ___ VIII ___ IX ___ X ___ TOTAL _____

October 9
2009

Mathematics 105
Calculus I
Examination #1

Mr. Haines

(6) I. Suppose that the function f has rule

$$f(x) = \begin{cases} -1 & \text{if } x < 0 \\ 0 & \text{if } 0 \leq x < 2 \\ 1 & \text{if } 2 \leq x \end{cases}$$

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

(6) II. Suppose $f'(0.9)$ is 7 and $f'(1.1)$ is 3

Use this information to estimate $f''(1.0)$ _____ .

(12) III. Sketch a graph of any function f whose graph contains the points $(1, 2)$, $(5, 2)$, and $(7,0)$ with the properties:

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

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

C. 7 is a stationary point.

D. Give the intervals on which f is increasing.

(10) IV. Suppose that $f'(x) = x^2 - 4$.

A. f' increases on the interval _____.

B. f is concave down on the interval _____.

C. f decreases on the interval _____.

D. f'' increases on the interval _____.

E. f is concave down on the interval _____.

(10) V. Let $f(x) = 15 - 3x^2$. Use the limit definition of the derivative to compute $f'(2)$.

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

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

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

C. $\lim_{h \rightarrow 0} \frac{f'(3+h) - f'(3)}{h} =$ _____

D. $\lim_{x \rightarrow 1} \frac{f(x) - f(1)}{x - 1} =$ _____

(12) VII. If $f(x) = \frac{x-4}{x-4}$,

A. $f(2)$ _____

B. $\lim_{x \rightarrow 2} f(x) =$ _____

C. $\lim_{x \rightarrow 4} f(x) =$ _____

D. Is f continuous at $x = 4$? Why or why not?

(12) VIII. Suppose $f(x) = x^2 - 2x - 5$ on $[-2, 2]$.

A. Find all the stable points of f on $[-2, 2]$.

B. Find the minimum and maximum value of f over $[-2, 2]$.

(10) IX. If $f(x) = 2 + 3x + x^4$, give the equation of the tangent line to the derivative of f at the point $(1, f'(1))$.

(10) X. Solve the IVP (initial value problem) $1 = x^2 - y'(x)$ if $y(2) = 10$.