Name:_____
M242: Calculus I (Fall 2017)
Instructor: Justin Ryan
Chapter 3 Exam

WICHITA STATE UNIVERSITY

Read and follow all instructions. You may not use any notes or electronic devices. All you need is a pencil and your brain!

Part I: True/False [2 points each]
*Neatly write **T** if the statement is always true, and **F** otherwise.*

_____**1.** If $f'(c) = 0$, then f has a local maximum of minimum at c.

_____**2.** If f has a local maximum of minimum at c, then $f'(c) = 0$.

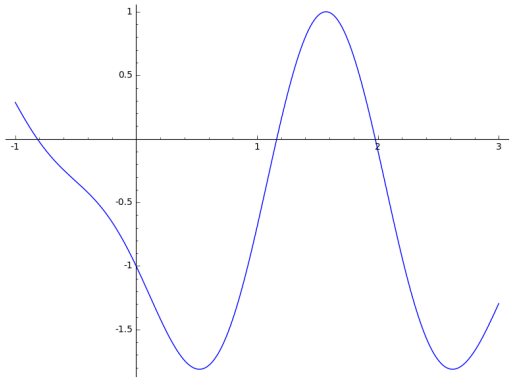
_____**3.** If f and g are increasing on (a,b), then fg is increasing on (a,b).

_____**4.** If f' is continuous and $f'(x) \neq 0$ for all x, then $f(0) \neq f(1)$.

_____**5.** If $f''(2) = 0$, then $(2, f(2))$ is an inflection point of the curve $y = f(x)$.

Part II: Multiple Choice [5 points each]
Compute the derivatives of the given functions. Select the best answer and write its corresponding letter neatly on the given line.

_____**6.** Consider the graph of a function $y = f(x)$ below. You wish to use Newton's method to approximate the middle root. What should your initial guess be?



A. $x_0 = -1$ **B.** $x_0 = 0$

C. $x_0 = 1$ **D.** $x_0 = 1.5$

7–14. Consider the function $f(x) = \dfrac{\sqrt{x^2-1}}{x-1}$.

_____**7.** What is the domain of f?

A. $[-1,1)$ **B.** $(-\infty,-1]\cup(1,\infty)$

C. $(-\infty,-1)\cup(1,\infty)$ **D.** All real numbers

_____**8.** Compute $\lim_{x\to\infty} f(x)$.

A. 1 **B.** $+\infty$

C. -1 **D.** $-\infty$

_____**9.** Compute $\lim_{x\to-\infty} f(x)$.

A. 1 **B.** $+\infty$

C. -1 **D.** $-\infty$

_____**10.** Compute $\lim_{x\to-1^-} f(x)$.

A. $+\infty$ **B.** 0

C. $-\infty$ **D.** $-\dfrac{1}{2}$

_____**11.** Compute $\lim_{x\to1^+} f(x)$.

A. $+\infty$ **B.** 0

C. $-\infty$ **D.** 1

Recall, 7–14. Consider the function $f(x) = \dfrac{\sqrt{x^2-1}}{x-1}$.

_____**12.** On what interval(s) is f increasing?

A. $(-\infty,-1)\cup(1,\infty)$ **B.** $(-\infty,-1)$

C. $(1,\infty)$ **D.** Never increasing

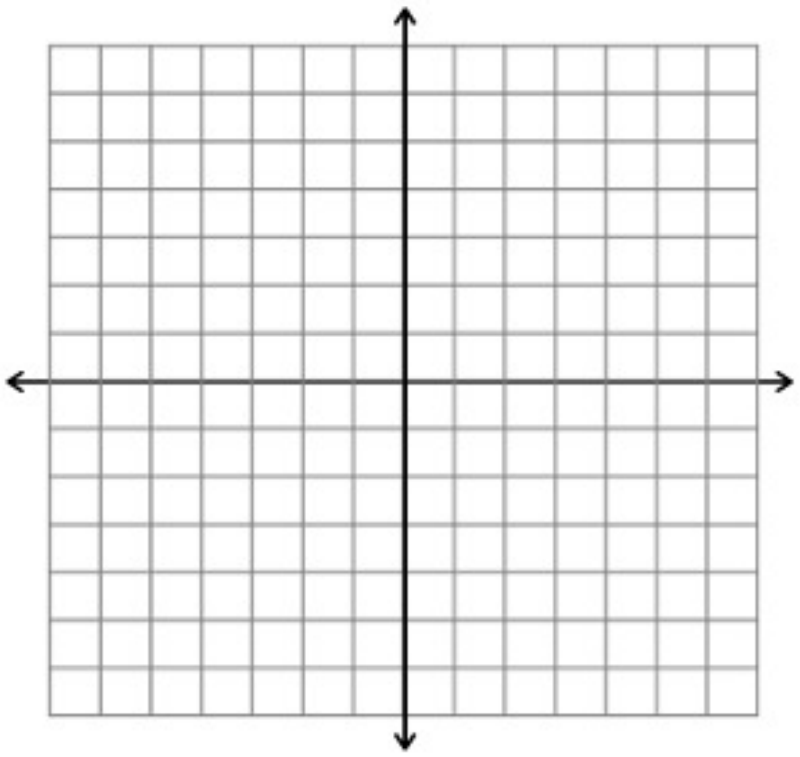
_____**13.** On what interval(s) is the graph of f concave up?

A. $(-\infty,-1)\cup(1,\infty)$ **B.** $(-\infty,-1)$

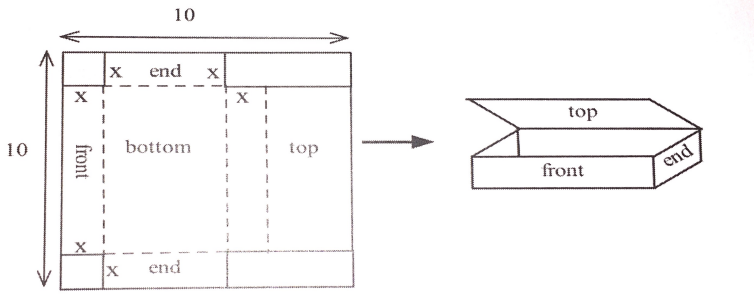
C. $(1,\infty)$ **D.** Never concave up

Part III: Written Problems [10 points each]
Complete all problems, showing enough work.

14. Sketch the graph of $f(x) = \dfrac{\sqrt{x^2-1}}{x-1}$. Include labels and all other pertinent information.



15. You have a 10 inch by 10 inch piece of cardboard which you plan to cut and fold as show in the figure to form a box with a top. Find the dimensions of the box that has the largest volume. Leave your answer(s) as fractions.



16. Find two positive numbers x and y satisfying $x + 4y = 100$, such that their product is a maximum.

17. Consider the function $f(x) = x^2 - x - 2$ on the interval $[-1, 2]$. (*a.*) Verify that the hypotheses of Rolle's Theorem are satisfied. (*b.*) Find the number c in $(-1, 2)$ guaranteed by Rolle's Theorem.

18. Suppose f is continuous on $[5, 10]$, $f(10) = 25$, and $1 \leq f'(x) \leq 3$ for all x in the interval $(5, 10)$. What is the smallest possible value of $f(5)$?