Math 141 Calculus I

Exam #2
March 28, 2018

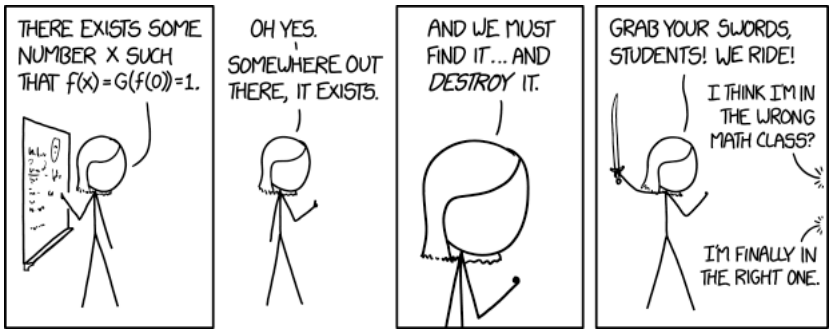
Instructor: Ann Clifton

Name: _____

Do not turn this page until told to do so. You will have a total of 1 hour and 15 minutes to complete the exam. You **must** show all work to receive full credit unless otherwise noted.
NO CALCULATOR/PHONE ALLOWED.
Cheating of any kind on the exam will not be tolerated and will result in a grade of 0%. Draw a bunny on this page if you read these directions in full.

#	score	out of	#	score	out of
1		4	8		8
2		4	9		8
3		4	10		10
4		4	11		10
5		4	12		10
6		8	13		18
7		8	Total		100

Remember: This exam has no impact on your worth as a human being. You got this!!!



True or False. No work/explanation required. 4pts each. True means always true.

1. *If a function is continuous, it is always differentiable.*

2. *A critical point c is only where $f'(c) = 0$.*

3. *If f and g are differentiable functions of x, then $(fg)'(x) = f'(x)g(x) + f(x)g'(x)$.*

4. *If $f''(c) = 0$, then $x = c$ is an inflection point of f.*

5. *The absolute value function, $f(x) = |x|$, is differentiable at $x = 0$.*

Multiple Choice. No work required. 8pts each. Choose the best answer. There is only one correct answer but you may choose up to *two*. If you choose two and one of the answers is correct, you will receive half the points.

6. *Find $\frac{dy}{dx}$ (Hint: Use trig identities to simplify):*

$$y^{\cot x} = 6$$

A. $\frac{dy}{dx} = -y \ln y \csc^2 x$ **B.** $\frac{dy}{dx} = y \ln y \csc x \sec x$

C. $\frac{dy}{dx} = y \ln y \cot x$ **D.** $\frac{dy}{dx} = \cot x$

7. *Find* $h'(2)$*, given that* $f(2) = -3$*,* $g(2) = 4$*,* $f'(2) = -2$*, and* $g'(2) = 7$*, if* $h(x) = \dfrac{g(x)}{1 + f(x)}$.

A. $h'(2) = -7/2$ **B.** $h'(2) = -11/2$

C. $h'(2) = -3/2$ **D.** $h'(2) = -1/2$

8. *Find the derivative,* y'*:*

$$y = \arctan\left(4x^2\right)$$

A. $y' = \frac{1}{1+2x^3}$ **B.** $y' = \frac{8x}{1+16x^4}$

C. $y' = \frac{1}{\sqrt{1+16x^4}}$ **D.** $y' = \frac{1}{1+16x^4}$

9. *Find the derivative,* y'*:*

$$y = \frac{-2x^3 - 5x + \sqrt{x}}{x^2}$$

A. $y' = \frac{-6x^2-5+\frac{1}{2}x^{-1/2}}{2x}$ **B.** $y' = -7 + \frac{1}{2}x^{-1/2}$

C. $y' = (-6x^2 - 5 + \frac{1}{2}x^{-1/2})x^2 - 2x(-2x^3 - 5x + \sqrt{x})$ **D.** $y' = -2 + \frac{5}{x^2} - \frac{3}{2x^{5/2}}$

Short Answer. You must show all work to receive full credit. Simplify your answers.

10 (10 points)**.** *A student turns in the incorrect solution to the problem below. Explain the student's mistake in words, using complete sentences. Then work out the correct solution.*

$$\frac{d}{d\theta}(\theta^2 \tan\theta) = 2\theta \sec^2\theta$$

11 (10 points)**.** *Find the value or values of c that satisfy the equation*

$$\frac{f(b) - f(a)}{b - a} = f'(c)$$

in the conclusion of the Mean Value Theorem for the function $f(x) = x^2 + 2x - 1$ on $[0, 1]$.

12 (10 points)**.** *When a circular plate of metal is heated in an oven, its radius increases at a rate of 0.01 cm/min. At what rate is the plate's area increasing when the radius is 50cm? (Recall the area of a circle is given by $A = \pi r^2$.)*

13. *(18 pts) Sketch the curve*

$$y = \frac{x^2 - 4}{2x}$$

(a) State the domain.

(b) Find the intercepts. Enter NONE if there are none.

x-intercepts: _____

y-intercept: _____

(c) Is the function even, odd, or neither? What type of symmetry does the function have?

(d) Find the asymptotes. Enter NONE if there are none.

Horizontal: _____

Oblique: _____

Vertical: _____

(e) Find the intervals where the function is increasing and decreasing. Enter NONE if not applicable.

Increasing: _____

Decreasing: _____

(f) State the local maximum and local minimum value(s). Enter NONE if not applicable.

Local maximum value(s): _____

Local minimum value(s): _____

(g) Find the intervals on which the function is concave up and concave down. State the inflection points. Enter NONE if not applicable.

Concave Up: _____

Concave Down: _____

Inflection Points: _____

(h) Use parts (a)-(g) to sketch the curve. Be sure that your graph is labeled and neat. Messy/incoherent graphs will receive zero points.