Math 229 Calculus Computer Lab Fall 19 Final a

Name: _____Solutions_____

- I will count your best 8 of the following 10 questions.
- You may only use `julia` during this exam. No calculators or cell phones.

1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
	80	

Final	
Overall	

1

(1) Convert the following `julia` expressions to standard mathematical expressions. Use parentheses if necessary to clearly indicate the order of operations:

(a) `b-a/b-b/c`

$$b - \frac{a}{b} - \frac{b}{c}$$

(b) `sin(1/4*x^2)/2x^3`

$$\frac{\sin\left(\frac{x^2}{4}\right)}{2x^3}$$

(2) Write out the julia commands for the following mathematical expressions.

(a) $f(x) = \dfrac{\sin^2(4x)}{\sqrt{2x+2}}$

sin(4x)^2/(sqrt (2x)+2)

(b) $g(x) = \dfrac{\tan^{-1}(3x)}{e^{2x} - 1}$

atan (3x)/(exp(2x)-1)

(3) Using your answer to the previous question, compute the following to five decimal places:

(a) $f(g(2))$

0.0049189

(b) $g(f'(4.5))$

1.47332

(4) Find all solutions (to at least 4 decimal places) to the equation

$$\frac{x}{x+3}\sin^2(2x-1) = \frac{x}{2} - 30.$$

Write down the `julia` command you use.

−2.96567

60.08429

60.44130

61.28072

(5) Use `julia` to find

$$\lim_{x \to 0} \frac{\cos(2x^2) - 1}{e^{-3x^4} - 1},$$

by any method; write both the `julia` commands and your answers.

$$\frac{2}{3}$$

(6) Consider the function $f(x) = (x^2 - 3x)e^{-x^2}$. Use julia to find all the critical points; write both the julia commands and your answers.

-0.77640 max

0.61019 min

3.16621 max

(7) Consider a function $f(x)$ for which $f'(x) = 10\sin(x/2) - x^2$ for $0 \leq x \leq 10$. Use julia to find all the intervals on which the function is concave up; write both the julia commands and your answers.

$$[0, 1.67412]$$

(8) Use the built in Newton's method `newton` to find all zeros of $f(x) = 2\log(2x) + 5\cos(x)$; write both the `julia` commands and your answers.

0.041129

2.20663

3.77126

(9) Find the closest point on the curve $y = 3/x + 3$ to the point $(5,6)$. How far away is it? Write both the `julia` commands and your answers.

$(4.67647, 3.64151)$

distance 2.38058

(10) Use `julia` to find the area under the curve of

$$f(x) = \frac{e^{-3x}}{\sqrt{x+4}}$$

between 2 and 6. Write both the `julia` commands and your answers.

0.00032863