

Math 229 Calculus Computer Lab Spring 16 Sample Midterm 1

- You may only use `julia` during this exam. No calculators or cell phones.
- (1) Convert the following `julia` expressions to standard mathematical expressions. Use parentheses if necessary to clearly indicate the order of operations:
- (a) `x+y/x-z`
 - (b) `cos(x)^2/5*sqrt(x)`
 - (c) `(x+y*(z-x))/(y+x/2)`
- (2) Convert each of the following expressions to its `julia` equivalent:
- (a) x^{y^z}
 - (b) $\frac{x}{1 + \frac{y}{z+1}}$
 - (c) $\frac{\sin^2 x}{8} + \frac{5e^{\sqrt{x}}}{3}$

Explain how you would check each one was correct, and do so.

- (3) Is $1/3x$ the same as $1/3*x$? How would you check? Explain.
- (4) You want to compute a decimal approximate to $1/\sqrt{7}$. Explain what the following `julia` commands compute, or why they give an error.
- (a) `1/7^1/2`
 - (b) `1/(7^1/2)`
 - (c) `1/sqrt(7^(-1))`

Write down a `julia` command which produces a decimal approximate to $1/\sqrt{7}$. Explain how to check your result.

- (5) Plot the following functions on the interval $(\pi, 6)$.

$$f(x) = \frac{\sin(11x)}{e^x}$$

$$g(x) = \frac{\cos(11x)}{e^x}$$

- (a) Sketch the graphs.
- (b) What is the number of local minima for each function? (Exclude endpoints)
- (c) What is the number of local maxima for each function? (Exclude endpoints)
- (6) Find the minimum (to two decimal places) of $f(x) = \left(\cos(x) + \frac{1}{(x - \pi)^2} \right)$ on $(0, \pi)$. Write down the `julia` commands you used to get your answer.
- (7) Use `julia` to find where the following functions are equal (to two decimal places). Write down the `julia` commands, and/or explain how you got your answer.

$$f(x) = 5 \cos(3x) \quad \text{and} \quad g(x) = -7x + 50$$

- (8) Write down `julia` commands to define two functions $f(x) = \frac{1+x^2}{3}$ and $g(x) = \sin^2\left(\frac{1}{2x}\right)$, and compute $f(g(1))$.
- (9) Write down `julia` commands to define a function $f(x)$ which has value 1 for $-1 \leq x \leq 1$ and 0 for other values of x , and plot its graph to check you are correct.