

Math 229 Calculus Computer Lab Spring 16 Midterm 1b

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 or notes.

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

Midterm 1	
Overall	

- (1) Convert the following julia expressions to standard mathematical expressions. Do not simplify.

(a) $x+y/z-x$

$$x + \frac{y}{z} - x$$

(b) $\cos(x^2)/3*x$

$$\frac{x}{3} \cos(x^2)$$

1	10
2	10
3	10
4	10
5	10
6	10
7	10
8	10
9	10
10	10
00	

	Mathematics
	Overall

- (2) Convert the following julia expressions to standard mathematical expressions. Do not simplify.

(a) `sin(2*x^2)^2/4`

$$\frac{1}{4} \sin^2(2x^2)$$

(b) `x/y/z+1`

$$\frac{x}{yz} + 1$$

(3) Convert each of the following expressions to its Julia equivalent:

(a) $\frac{x-y}{x+y}$

$$(x-y)/(x+y)$$

(b) $\frac{1}{\frac{c}{1-a} + b}$

$$1/(c/(1-a) + b)$$

(4) Convert each of the following expressions to its Julia equivalent:

(a) $\frac{\tan^2(2x)}{4}$

$$\tan(2x)^2 / 4$$

(b) $\frac{e^{\sqrt{x+1}}}{3}$

$$\exp(\sqrt{x+1}) / 3$$

- (5) You want to compute a decimal approximate to $1/\sqrt{10}$. Explain what the following julia commands compute, or why they give an error.

(a) $1/\underbrace{10^{1/2}}$

$$1/10 / 2 = \frac{1}{20}$$

(b) $1/(\underbrace{10^{1/2}})$

$$1/(10/2) = \frac{2}{10} = \frac{1}{5}$$

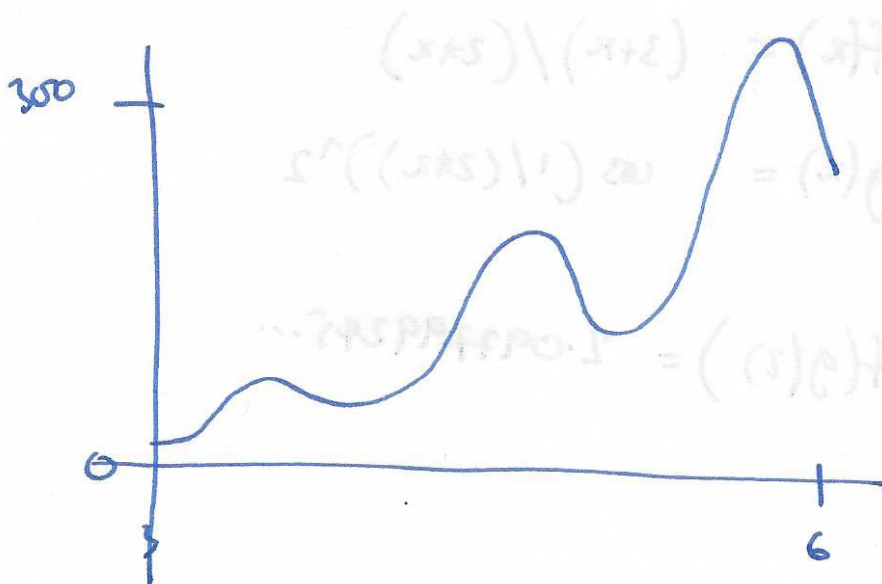
- (c) Write down a julia command which produces a decimal approximate to $1/\sqrt{10}$. Explain how to check your result.

$$1/\text{sqrt}(10) \approx 0.316227766\dots$$

$$\text{check: } 1/0.316227766^2 \approx 10$$

(6) Plot the function $f(x) = \frac{e^x}{\cos(6x) + 2}$ on the interval $(3, 6)$.

(a) Sketch the graph.



(b) How many local maxima are there for the function? (Exclude endpoints)

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- (7) Write down julia commands to define two functions $f(x) = \frac{3+x}{2x}$ and $g(x) = \cos^2(\frac{1}{2x})$, and compute $f(g(2))$.

$$f(x) = (3+x)/(2*x)$$

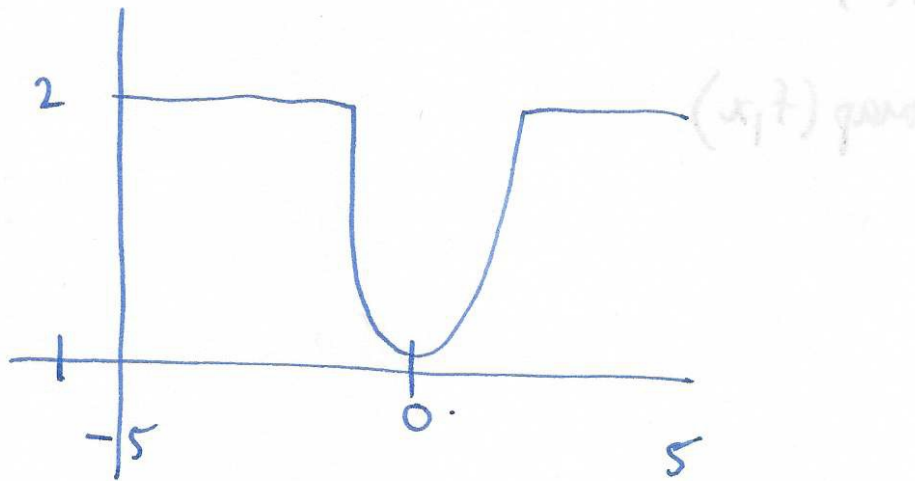
$$g(x) = \cos(1/(2*x))^2$$

$$f(g(2)) = 2.097799245\dots$$

- (8) Write down julia commands to define a function $f(x)$ which has value $x^2 + 1$ for $-1 \leq x \leq 1$ and 2 for other values of x , and plot its graph to check you are correct.

$$f(x) = -1 \leq x \leq 1 ? x^2 + 1 : 2$$

$$\text{plot}(f, -5, 5)$$



- (9) Write down julia commands to make a list of numbers from 1 to 20, and then a list of their squares.
Hint: you may use linspace and map.

$x = \text{linspace}(1, 20, 20)$

$f(x) = x^2$

$\text{map}(f, x)$



- (10) Find the minimum value of $f(x) = e^x + 8/x^2$, for positive values of x , to two decimal places.

$$f(x) = \exp(x) + 8/(x^2)$$

$$\text{plot}(f, 0, 10)$$

$$\text{plot}(f, 0.1, 6)$$

etc.

then zoom in

$$x \approx 1.52$$

$$\text{min value of } f \approx 8.03$$