Math 229 Calculus Computer Lab Spring 15 Midterm 1a

Name: Solutions

- I will count your best 5 of the following 6 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	
	50	

Midterm 1	
Overall	

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

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

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

(b) `cos(x^2)/5*x`

$$\frac{\cos(x^2)\,x}{5}$$

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

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

(2) Convert each of the following expressions to its `julia` equivalent:

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

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

(b) $\frac{1}{x+\frac{y}{z+1}}$

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

(c) $\frac{\sin^2(2x)}{2}+\frac{e^{\sqrt{x}}}{3}$

```
(sin(2*x)^2)/2 + (e^(sqrt(x)))/3
```

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

(a) `1/5^1/2`

order of operations: $(5^1) = 5$

$1/5/2 = \frac{\frac{1}{5}}{2} = \frac{1}{10} = 0.1$

(b) `1/(5^1/2)`

order of operations: $5^1 = 5$

$1/(5/2) = 2/5 = 0.4$.

(c) `1/sqrt(5^(-1))`

error 5 is an integer type, can't take it to a negative power.

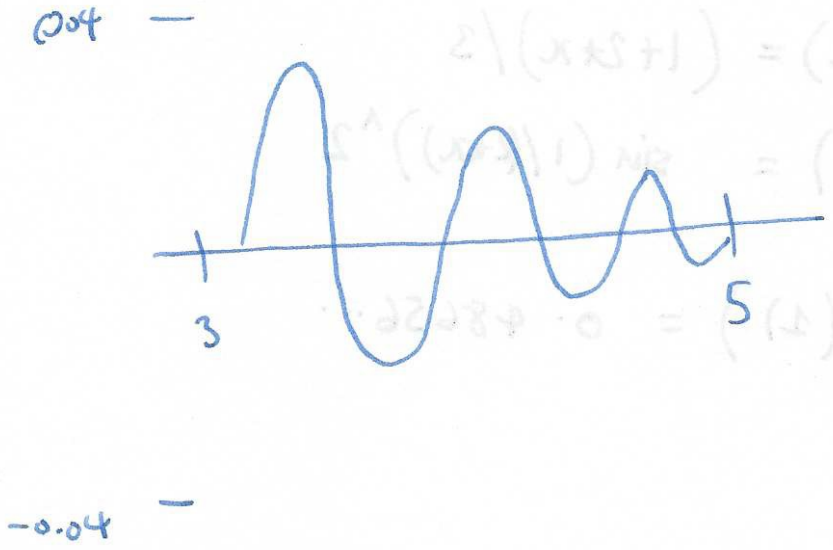
Write down a `julia` command which produces a decimal approximate to $1/\sqrt{5}$. Explain how to check your result.

`1/sqrt(5)` or `5^(-0.5)`.

check: multiply answer by itself and take reciprocal

(4) Plot the function $f(x) = \dfrac{\sin(10x)}{e^x}$ on the interval $(\pi, 5)$.

(a) Sketch the graph.



(b) What is the number of local minima for the function? (Exclude endpoints)

3.

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

```
f(x) = (1+2*x)/3
g(x) = sin(1/(2*x))^2
```

$f(g(1)) = 0.48656\cdots$

(6) Write down `julia` commands to define a function $f(x)$ which has value 1 for $1 \leq x \leq 3$ and 0 for other values of x, and plot its graph to check you are correct.

```
function f(x)
    if 1 <= x <= 3
        return 1
    else
        return 0
    end
end
```

```
f(x) = 1 <= x <= 3 ? 1 : 0
```