Math 229 Calculus Computer Lab Spring 15 Midterm 1b

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)/3*x`

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

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

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

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

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

(c) $\dfrac{\cos^2(2x)}{2}+\dfrac{e^{\sqrt{x}}}{5}$

```
(cos(2*x)^2)/2 + exp(sqrt(x))/5
```

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

(a) `1/3^1/2`

order of operations : $3^1 = 3$

$1/3/2 = \frac{\frac{1}{3}}{2} = \frac{1}{6}$

(b) `1/(3^1/2)`

order of operations $3^1 = 3$ $1/(3/2) = 1/3/2 = 2/3$

(c) `1/sqrt(3^(-1))`

error : 3 is an integer, negative powers of integers not defined.

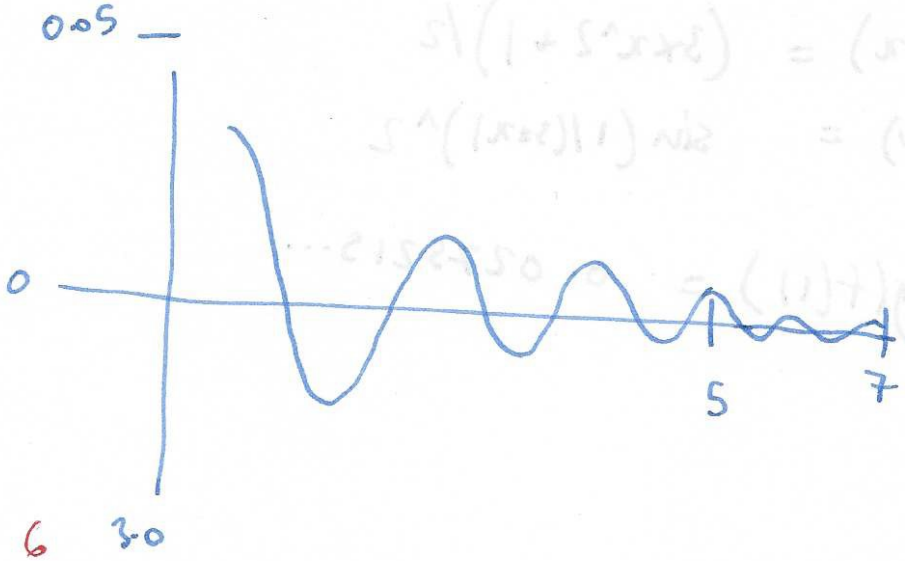
Write down a `julia` command which produces a decimal approximate to $1/\sqrt{3}$. Explain how to check your result.

`1/sqrt(3)`

check: multiply number by itself and take reciprocal.

(4) Plot the function $f(x) = \dfrac{\cos(10x)}{e^x}$ on the interval $(\pi, 7)$.

(a) Sketch the graph.



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

4 6

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

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

$g(f(1)) = 0.0275215\cdots$

(6) Write down `julia` commands to define a function $f(x)$ which has value 2 for $-2 \leq x \leq 2$ and 0 for other values of x, and plot its graph to check you are correct.

```
function f(x)
    if -2 <= x <= 2
        return 2
    else
        return 0
    end
end
```

```
f(x) = -2 <= x <= 2 ? 2 : 0
```