Math 229 Calculus Computer Lab Spring 15 Sample Midterm 3

- 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 to clearly indicate the order of operations:

   (a) `x-y/z-x`

   (b) `tan(1/2x^2)*1/2*x^2`

   (c) `(a+b)/b-a/c/2*3`

(2) Consider the function $f(x) = x^2 e^{-x/4} - x$. Use `julia` to find all the critical points; write both the `julia` commands and your answers.

(3) Consider a function $f(x)$ for that $f'(x) = 10\sin(x) - 2 + x^2$. Use `julia` to find all the critical points; write both the `julia` commands and your answers.

(4) Consider the function $f(x) = x^3 - 10x + e^x$. Where is the function concave up and concave down?

(5) Use the built in Newton's method `newton(f, fp, x)` to find all zeros of $f(x) = \tan^{-1}(x) + \dfrac{100\sin(x)}{10 + x^2}$, where `fp(x) = D(f)(x)`.

(6) Use the built in Newton's method `newton(f, fp, x)` to find all zeros of $f(x) = e^{-1/x^2} - 1/2$, where `fp(x) = D(f)(x)`. Explain why `newton(f, fp, 0)` doesn't work.