**Math 151 Lab 4**

Use Python to solve each problem.

1. Let $f(x) = \dfrac{5x}{1+x^2}$:
   a) Find the equation of the tangent line at the point where $x = 2$.
   b) Graph the function and the tangent line in the domain $x \in [0, 4]$
2. Suppose Marvin throws a rock on the planet Mars with initial velocity 10 m/s. The height of the rock is then given by $s(t) = 1 + 10t - 1.86t^2$. (Approximate answers acceptable in this problem)
   a) Find the velocity of the rock after 1 second.
   b) At what time will the velocity be 0, and what is the height of the rock at that time?
   c) With what velocity will the rock hit the surface?
3. Given $f(x) = xe^{-|x|}$
   a) Plot $f$ on the domain $x \in [-5, 5]$
   b) Find the equations of all horizontal tangent lines (NOTE: to make life easier, force the variable $x$ to be real using the command **x=symbols('x',real=True)** ).
4. Given $f(x) = x\sin(x)$:
   a) Find the first 16 derivatives of $f$ (NOTE: this can be easily done using list comprehension!).
   b) Given a number $n$ that is divisible by 4, in separate print commands, state the formula for the $n$th derivative, the $(n+1)$th derivative, the $(n+2)$th derivative, and the $(n+3)$th derivative of $f$ (i.e, $f^{(n)}(x)$, $f^{(n+1)}(x)$, $f^{(n+2)}(x)$, and $f^{(n+3)}(x)$ ).