Math 126 with Dr. Loveless - Worksheet 1
Review of Calculus 1 and 2 Skills needed for Math 126 and preview of Taylor polynomials

On a separate sheet of paper, attempt the following problems that require derivative and integral skills; feel free to skip around. You are welcome to use your book as reference. There is no pressure here, just do what you can. Hand it what you finish. Provided you make some attempt at the problems you will get a participation point for the day. Attempt the problems on your own first and then ask your TA for help. We will use these skills this quarter (each of the skills below will be used at some point during this quarter, in fact a couple of these problems I pulled directly from parts of homework you will do later in the quarter).

1. *Derivatives*

   (a) Find $f'(x)$ if $f(x) = 2\ln(1+3x)$.

   (b) Find $f'(x)$ if $f(x) = 5\ln(1+3x)$.

   (c) Find $f'(x)$ if $f(x) = b\ln(1+3x)$ where b is a constant.

   (d) Find $\dfrac{dy}{dx}$ if $y = t\cos(e^{t^2}) + x$, where t is a constant.

   (e) Find $\dfrac{du}{dv}$ if $u = \arctan(a\sqrt{v})$, where a is a constant.

   (f) Find $\dfrac{d^2y}{dt^2}$ if $y = \ln(\cos(t+c))$, where c is a constant.

2. *Integrals*

   (a) Evaluate $\displaystyle\int_e^{e^2} \frac{dx}{x(\ln x)^p}$, in each of the following cases:

      i. $p = 0$;

      ii. $p = 1$;

      iii. p is a constant, $p \neq 1$.

   (b) Evaluate $\displaystyle\int xe^{-2x}\,dx$.

   (c) Evaluate $\displaystyle\int_{2/3}^{\infty} \frac{dx}{9x^2+4}$.

3. *Tangent Lines*

   Find the equation of the tangent line (this is the linear approximation of $f(x)$ at $x = 0$) to $f(x) = \sqrt{1-x}$ at $x = 0$.

   (a) Sketch a graph of $f(x)$ and your tangent line.

   (b) Use the equation of the tangent line to approximate the value of $\sqrt{0.99}$.

   (c) Replace $\sqrt{1-x}$ by your linear approximation to approximate a solution to $\sqrt{1-x} = 0.8$. (Then solve to find the exact value and compare).

   (d) Use the equation of the tangent line to approximate $\int_0^1 \sqrt{1-x}\,dx$. (Then integrate to find the exact value and compare).

   In the last two weeks of the quarter, we will discuss Taylor Polynomials. The linear approximation you get from the tangent line is the first Taylor polynomial. We will extend this idea to higher order Taylor polynomials that can approximate functions to higher degrees of accuracy (and then can be used the solve the same types of questions as above with function where is it is not possible to solve for an exact value).