The problems in parts 1, 2, and 3 below should be review from your previous mathematics courses. The first quiz may include a similar review problem. Please work as many of these problems as you can before quiz section. In groups in the first quiz section, you will compare results on these problems, discuss any you do not fully understand, and work together on part 4.

[1] *Review: Differentiation.*

(a) Find $f'(x)$ if $f(x) = \sec^3 x/(1+x^2)$. Determine the domain of $f'(x)$.

(b) Find $\dfrac{d^2y}{dt^2}$ if $y = \arctan t$.

(c) Find $\dfrac{dy}{dx}$ if $y = x^3 \cos(5^{x^2})$.

(d) Find $\dfrac{du}{dv}$ if a and b are constants and $u = \ln(a(\tan(bv))$.

[2] *Review: Integration.*

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

(b) Evaluate $\displaystyle\int_{e}^{e^2} \frac{dx}{x(\ln x)^p}$, where p is a constant.

(Be sure to consider all possible real number values for p.)

(c) Evaluate $\int x3^{-2x}dx$.

[3] *Review: Tangent line approximation and tangent lines.* Find the tangent line approximation (also called the linear approximation) of the function $f(x) = \sqrt{1-x}$ at $a = 0$, and use it to approximate the numbers $\sqrt{0.9}$ and $\sqrt{0.99}$. Graph the function f and the tangent line at the point $a = 0$. Based on the picture, determine if your estimates are above or below the actual values.

[4] *Tangent Line Error Bound.* Consider the function $f(x) = \int_0^x \sqrt{4-\sin(\pi t)}\,dt$. (You should *not* try to find a formula for f.)

(a) What is $f(0)$?

(b) What is $f'(x)$?

(c) Find the tangent line approximation (1st Taylor Polynomial) for $f(x)$ based at zero.

(d) Use the Tangent Line Error Bound to find a bound on the error if you use the tangent line approximation for f on the interval $[-1/6, 1/6]$.

(e) Suppose you want the error to be no more than 0.01. Use the Tangent Line Error Bound to find an interval around zero on which you can be sure the error is at most 0.01. Note: The answer is not just the interval but also the argument showing that the bound on that interval is at most 0.01. The answer is not unique.