Warm-up Exercises
Math 1271,   TA: Amy DeCelles

1.) Consider $f(x) = 3x^2 + x + 7$. Let P be the point on the graph of $y = f(x)$ with x-coordinate $x = -2$, and Q the point on the graph with x-coordinate $x = 1$. Find the equation of the line PQ.

2.) Draw the parabola from problem 1. Draw the line PQ. This is a *secant* line. Draw a line that is tangent to the parabola at the point Q. How would you find the slope of this line?

3.) Consider $f(x) = e^{x^2}$. Write this as a composition of two functions $f(x) = (g \circ h)(x)$. What is $(h \circ g)(x)$?

4.) Find the domain of the following function:

$$f(x) = \frac{\sqrt{2x + 11}}{x^2 + x - 2}$$

5.) A bacteria culture grows exponentially: $P(t) = P_o e^{kt}$. (P is the number of bacteria after t hours.) After two hours there are 600 bacteria, and after eight hours the count is 75,000. Find the initial population (i.e. find P when $t = 0$.)

6.) (**Challenge**) A fence 8 feet tall runs parallel to a tall building at a distance of 4 feet from the building. What is the length of the shortest ladder that will reach from the ground over the fence to the wall of the building?

Some Answers:
1.) $y = -2x + 13$
3.) $g(x) = e^x$, $h(x) = x^2$; $(h \circ g)(x) = e^{2x}$
4.) All $x \geq -5.5$ except $x = -2, 1$.
5.) 120 bacteria
6.) 16.65 feet