Please work in groups with no more than four people and complete this worksheet during class. Hand in one worksheet for each group.

1. Let \( f(x) = x^2 + 1 \).

   (a) Find the slope of the tangent line at any point \( x \) on the graph, i.e. calculate
   \[
   \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}.
   \]

   (b) Find the slope of the tangent line at \( x = 2 \), i.e. calculate
   \[
   \lim_{h \to 0} \frac{f(2 + h) - f(2)}{h}.
   \]
2. Use the formula \( A = \pi r^2 \) for the area of a circle to find

(a) the average rate at which the area of a circle changes with \( t \) as the radius increases from \( r = 1 \) to \( r = 2 \), i.e. calculate \( \frac{\Delta A}{\Delta r} \) over the interval \( r \in [1, 2] \).

(b) the instantaneous rate at which the area changes with \( r \) when \( r = 2 \), i.e. calculate

\[
\lim_{\Delta r \to 0} \frac{\Delta A}{\Delta r}.
\]
3. If a rock, initially at rest is dropped from a height of 400 ft its height after $t$ seconds is given by

$$s(t) = -16t^2 + 400.$$ 

How long does it take to hit the ground and what is its velocity at impact?