

## MATH 210: 9-13 WORKSHEET

- (1) A ball being dropped from a height of 20 meters has its height  $y(t)$  in meters based on the number of seconds  $t$  since it was released modeled by  $y(t) = 20 - 5t^2$ . Determine the ball's velocity when it hits the ground. [Hint: velocity is the *instantaneous rate of change* of position.]
- (2) Calculate the slope of the tangent line to the curve  $y = 1/x$  at the point  $(1, 1)$ .
- (3) Use the limit definition for the slope of a tangent line to show that the tangent line at the point  $(x, y)$  on the unit circle has slope  $-x/y$ . If you're not sure how to start, here's an outline of how you might do it.
  - First, observe that it's enough to check this is true for the top half of the circle. (Why can you conclude this for the bottom half knowing it for the top half?)
  - The top half of the circle is given by the equation  $y = \sqrt{1 - x^2}$ , so we can think of  $y$  as a function of  $x$ .
  - Hint: it's easier to use the  $\lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$  formulation of the definition for this.
  - Hint: multiplying by the conjugate is a good trick :)