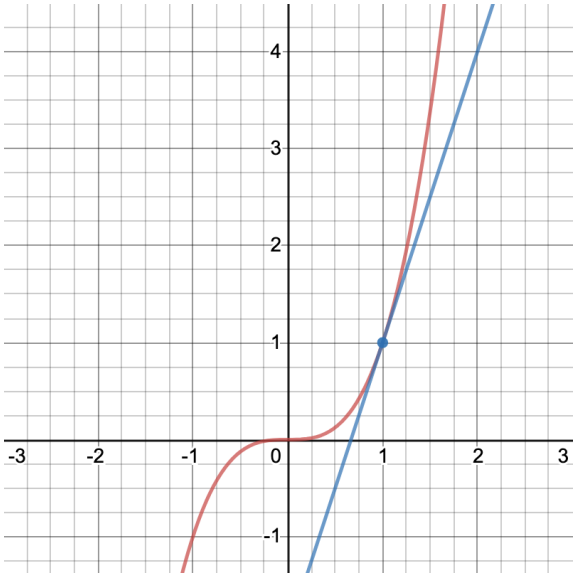
§2.1: Rates of Change and Tangents

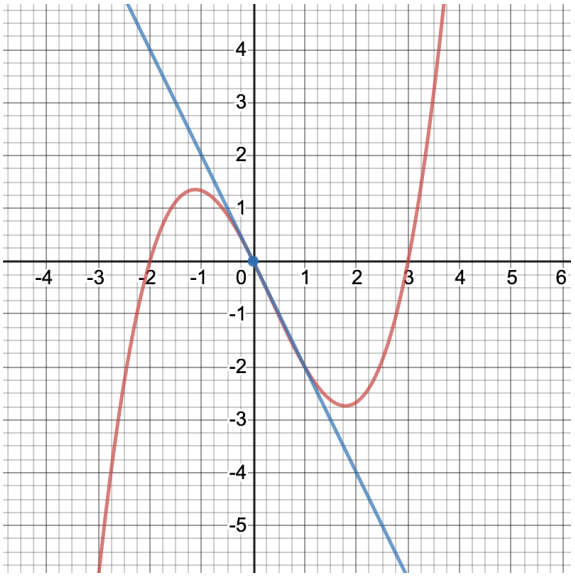
1.] Consider the following function below that describes the vertical distance travelled by a grenade launched vertically from the ground with a speed of 96 ft/sec:

$$f(x) = -16x^2 + 96x.$$

Here x is in seconds and $f(x)$ is in feet. Find the average velocity of the grenade between 1 and 3 seconds of it being in the air.

2.] Estimate the slope of the tangent line shown in the given graphs below:





3.] Consider the position function $y = 16x^2$, where y is the distance a piece of rock has fallen from a deep canyon, if we ignore air resistance. Here, y is measured in feet and x is measured in seconds. Estimate the instantaneous velocity of the rock after two seconds.

Time interval	$[2, 2.5]$	$[2, 2.1]$	$[2, 2.01]$	$[2, 2.001]$
Change in time (Δx)				
Change in distance (Δy)				
Average velocity $\left(\frac{\Delta y}{\Delta x}\right)$				

Time interval	$[1.5, 2]$	$[1.9, 2]$	$[1.99, 2]$	$[1.999, 2]$
Change in time (Δx)				
Change in distance (Δy)				
Average velocity $\left(\frac{\Delta y}{\Delta x}\right)$				

Make a conjecture about the value of the instantaneous velocity at $x = 2$.