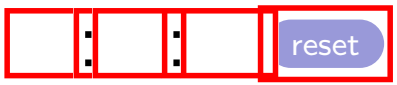
Bellwork 9/7

Find the slope of the tangent line to $f(x) = x^2$ at $(-2, 4)$ by approximating with secant lines.

$$P = (-2, 4), \ Q = (x, x^2)$$

$$m_{PQ} = \frac{x^2 - 4}{x - (-2)}$$

x	0	-1	-1.5	-1.9	-1.99
m_{PQ}					



Bellwork 9/7 - Solutions

$$P = (-2, 4),\ Q = (x, x^2)$$

$$m_{PQ} = \frac{x^2 - 4}{x - (-2)}$$

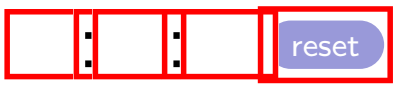
x	0	-1	-1.5	-1.9	-1.99
m_{PQ}	-2	-3	-3.5	-3.9	-3.99

$\Longrightarrow$ The slope of the tangent line to f at $(-2, 4)$ is $\boxed{-4}$.

Exercise 1

If a rock is thrown upward on the planet Mars with a velocity of 10 $\frac{m}{s}$, its height in meters t seconds later is given by $y = 10t - 1.86t^2$.

1. Find the average velocity over the given time intervals:
    1. $[1, 1.1]$
    2. $[1, 1.01]$
    3. $[1, 1.001]$
2. Estimate the instantaneous velocity when $t = 1$.



Exercise 1 - Solutions

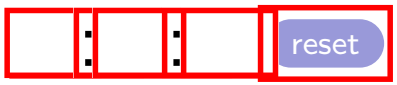
1. 1. $6.094 \frac{m}{s}$
   2. $6.2614 \frac{m}{s}$
   3. $6.27814 \frac{m}{s}$
2. $6.28 \frac{m}{s}$

Exercise 2

The table below shows the position of a motorcyclist after accelerating from rest.

t (seconds)	0	1	2	3	4	5	6
s (feet)	0	4.9	20.6	46.5	79.2	124.8	176.7

1. Find the average velocity for each time period:
   1. $[2, 4]$
   2. $[3, 4]$
   3. $[4, 5]$
   4. $[4, 6]$
2. Use the graph of s as a function of t to estimate the instantaneous velocity when $t = 3$.



Exercise 2 - Solutions

1. 1. $29.3 \frac{ft}{s}$
   2. $32.7 \frac{ft}{s}$
   3. $45.6 \frac{ft}{s}$
   4. $48.75 \frac{ft}{s}$
2. $29.68 \frac{ft}{s}$