

Name: _____

Date: _____

Learning Goal 2.3

Creating confidence in word problems.

Example The distance travelled by a free – falling object can be calculated by using the formula $s(t) = 4.9t^2$, where s represents the distance travelled in metres after t seconds. If a rock is dropped from the top of a 500 – metre cliff,

- a. Using the idea of a numerical limit of the slope, find the average velocity from:
- 4 seconds to 4.1 seconds
39.69 m/s
 - 4 seconds to 4.01 seconds
39.29 m/s
 - 4 seconds to 4.001 seconds
39.20049 m/s
- b. Estimate the instantaneous velocity at 4 seconds.
39.2 m/s

Example A manufacturer produces bolts of fabric with a fixed width. The cost of producing x yards of this fabric is $C = f(x)$ dollars.

- a. What is the meaning of the derivative, $f'(x)$? What are its units?
The instantaneous rate of change of cost with respect to yards made, measured in dollars per yard.
- b. In practical terms, what does it mean to say that $f'(1000) = 9$?
The cost of producing the 1000th yard is \$9.
- c. Which is greater, $f'(50)$ or $f'(500)$?
 $f'(50) > f'(500)$

Example An object moves in a straight line with its position at time t seconds given by $s(t) = -t^2 + 8t$, where s is measured in metres. Find the velocity when $t = 0$, $t = 4$ and $t = 6$.

$$s'(0) = 8, \quad s'(4) = 0, \quad s'(6) = -4$$

Example Find an equation of the line that is tangent to the graph of $f(x) = \sqrt{x+1}$ and parallel to $x - 6y + 4 = 0$.

$$y = \frac{1}{6}x + \frac{5}{3}$$

Example A football is kicked up into the air. Its height, h , above the ground in metres at t seconds can be modelled by $h(t) = 18t - 4.9t^2$. Determine $h'(2)$. What does this represent?

$$h'(2) = -1.6 \text{ m/s}$$

the velocity of the football after 2 seconds.

Example At what point on the graph of $y = x^2 - 4x - 5$ is the tangent parallel to $2x - y = 1$?

$$y = 2x - 14$$

Example Determine the equations of both lines that are tangent to the graph of $f(x) = x^2$ and pass through the point $(1, -3)$.

$$y = 6x - 9$$
$$y = -2x - 1$$

Example For the function $f(x) = x|x|$, show that $f'(0)$ exists. What is the value?

$$f'(0) = 0$$