

# MHF 4UI UNIT 3 RATES OF CHANGE

MORE Word Problems!!!



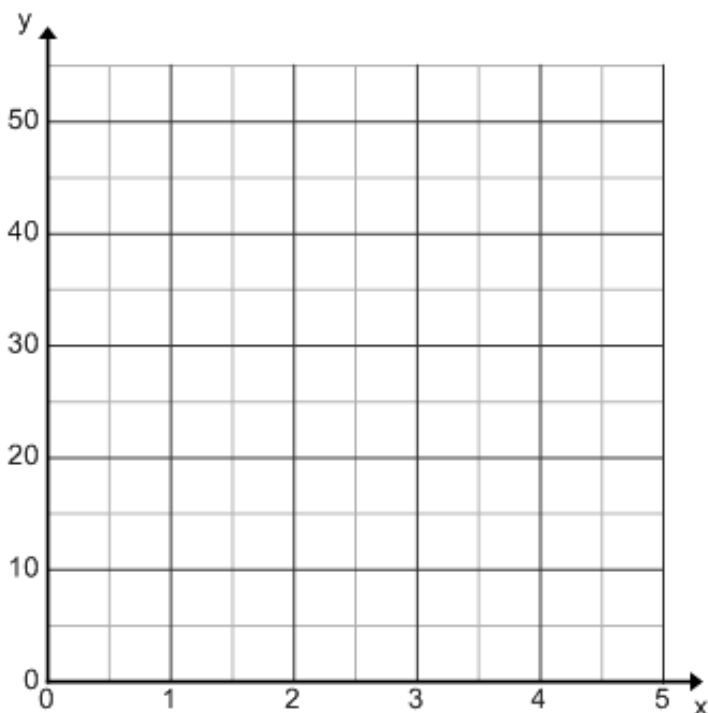
Example 1: Suppose the height of an object above the ground (in metres) after  $t$  seconds is given by the equation

$$s(t) = -4.9t^2 + 50$$

- a) Find the average velocity of the object from  $t = 2$  to  $t = 3$  seconds.

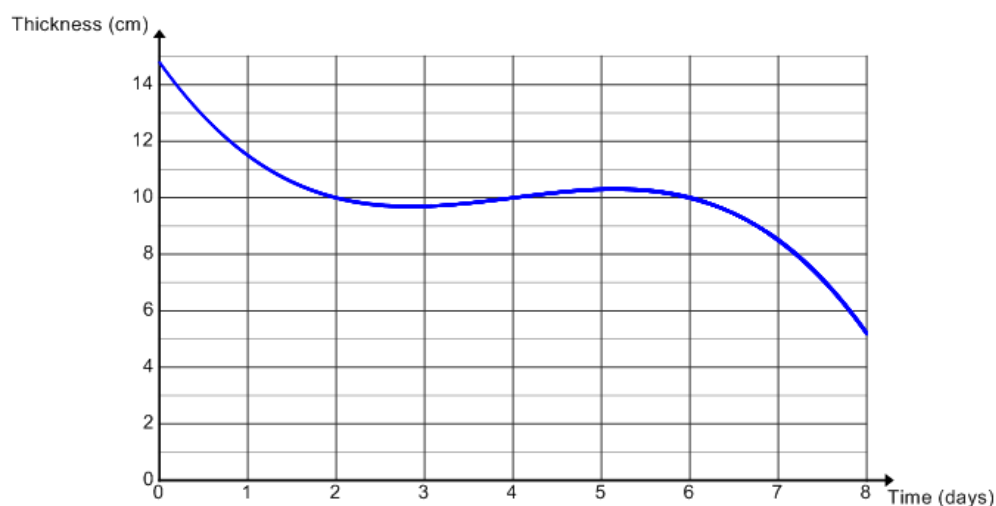
b) Find the velocity of the object when  $t = 2$  seconds  
(at the instant  $t=2$ )

c) Draw a sketch of the curve as well as the secant and the tangent.



## Example 2:

The thickness of the ice on a lake for one week is modelled by the function  $T(d) = -0.1d^3 + 1.2d^2 - 4.4d + 14.8$ , where  $T$  is the thickness in cm and  $d$  is the number of days after December 31st .



- When do you think the warmest day occurred during the week?
- Calculate the instantaneous rate of change when  $d = 1$ .

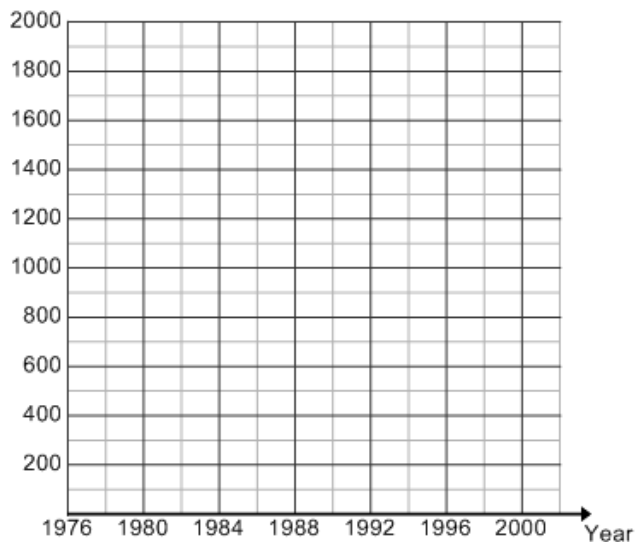
#### 4UI Unit 3 Day 6 Rates of Change Word problems.notebook

Example 3. (FROM # 10 pg 169)

The following table shows the number of outlets for a particular restaurant:

Year	Number of Outlets
1978	100
1984	200
1987	300
1989	400
1991	500
1993	700
1995	1100
1996	1400
1997	1500
1999	1800
2000	2000

a) Construct a scatter plot of the data.



b) Find the average rate of change for the following years:

i) 1984 to 1991

ii) 1991 to 1995

c) Estimate the instantaneous rate of change when  $t = 1991$   
(draw a tangent line and use it to estimate the slope)

Example 4: Population growth in Baden is modelled by the equation:  $P(t) = 0.8t^2 + 100t + 1000$   
where  $P$  is the population and  
 $t$  is the number of years from 2019

- a) What is the current population of the town?
- b) What is the population of the town in 10 years?
- c) What is the rate of change of the population in 10 years?

Example 5: A manufacturer of widgets finds that the profit from the sale of  $x$  widgets per week is given by the formula:

$$P(x) = 160x - x^2 \text{ dollars.}$$

- a) Find the profit at a production level of 40 widgets.
- b) Find the rate of change of profit at the production level of 40 widgets per week.



