

SOLUTIONS \Rightarrow RATE OF CHANGE EXAM REVIEW

1- Constant Rate of Change \Rightarrow Straight line

- Non-Constant Rate of Change \Rightarrow Curved line
* for example.
PARABOLA

- Instantaneous Rate of Change will be equal to zero at the vertex.

i)
a) $(2, 155)$
 $\begin{matrix} x_1 & y_1 \\ (6, 255) \\ x_2 & y_2 \end{matrix}$

$$\begin{aligned} \text{AROC} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{255 - 155}{6 - 2} \\ &= \frac{100}{4} \\ &= 25 \text{ bacteria/cm}^2/\text{hr} \end{aligned}$$

b) First 3 hours:

$$\begin{matrix} (0, 100) \\ x_1 & y_1 \\ (3, 160) \\ x_2 & y_2 \end{matrix}$$

$$\begin{aligned} \text{AROC} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{160 - 100}{3 - 0} \\ &= \frac{60}{3} \\ &= 20 \text{ bacteria/cm}^2/\text{hr} \end{aligned}$$

c) First 5 hours:

$$\begin{matrix} (0, 100) \\ x_1, y_1 \end{matrix}$$

$$\begin{matrix} (5, 250) \\ x_2, y_2 \end{matrix}$$

$$\begin{aligned} \text{AROC} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{250 - 100}{5 - 0} \\ &= \frac{150}{5} \\ &= 30 \text{ bacteria/cm}^2/\text{hr} \end{aligned}$$

d) $\begin{matrix} (1, 140) \\ x_1, y_1 \end{matrix}$

$$\begin{matrix} (5, 250) \\ x_2, y_2 \end{matrix}$$

$$\begin{aligned} \text{AROC} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{250 - 140}{5 - 1} \\ &= \frac{110}{4} \\ &= 27.5 \text{ bacteria/cm}^2/\text{hr} \end{aligned}$$

3.

a) Positive Rate of Change \Rightarrow A to B.

b) Negative Rate of Change \Rightarrow B to C

c) Zero

$$4. \quad y = -0.25x^2 + 6x - 2$$

$$x = 3.9$$

$$y = -0.25(3.9)^2 + 6(3.9) - 2$$

$$y = -0.25(15.21) + 23.4 - 2$$

$$y = -3.8025 + 23.4 - 2$$

$$y = 17.5975$$

$$(3.9, 17.5975)$$

$x_1 \quad y_1$

$$x = 4.1$$

$$y = -0.25(4.1)^2 + 6(4.1) - 2$$

$$y = -0.25(16.81) + 24.6 - 2$$

$$y = -4.2025 + 24.6 - 2$$

$$y = 18.3975$$

$$(4.1, 18.3975)$$

$x_2 \quad y_2$

$$\begin{aligned} \text{IROC} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{18.3975 - 17.5975}{4.1 - 3.9} \\ &= \frac{0.8}{0.2} \\ &= 4 \end{aligned}$$

5a) Sam was travelling at a constant speed for the first 6 hours. (0 to 6)

His speed was zero for the last 4 hours. (6 to 10)

b) Average Speed for Entire Trip.

$$\begin{matrix} (0, 0) \\ x_1, y_1 \end{matrix}$$

$$\begin{matrix} (10, 10) \\ x_2, y_2 \end{matrix}$$

$$\begin{aligned} \text{AROC} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{10 - 0}{10 - 0} \\ &= \frac{10}{10} \\ &= 1 \text{ m/h} \end{aligned}$$

$$6. h = -4.9t^2 + 29t + 1$$

$$a) t = 1$$

$$h = -4.9(1)^2 + 29(1) + 1$$

$$h = -4.9(1) + 29 + 1$$

$$h = -4.9 + 29 + 1$$

$$h = 25.1$$

$$(1, 25.1)$$

$$t = 2.5$$

$$h = -4.9(2.5)^2 + 29(2.5) + 1$$

$$h = -4.9(6.25) + 72.5 + 1$$

$$h = -30.625 + 72.5 + 1$$

$$h = 42.875$$

$$(2.5, 42.875)$$

$$\begin{aligned} b) \text{ AROC} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{42.875 - 25.1}{2.5 - 1} \\ &= \frac{17.775}{1.5} \\ &= 11.85 \text{ m/s} \end{aligned}$$

The ball is rising between 1 and 2.5 seconds.

$$c) t=1.9$$

$$h = -4.9(1.9)^2 + 29(1.9) + 1$$

$$h = -4.9(3.61) + 55.1 + 1$$

$$h = -17.689 + 55.1 + 1$$

$$h = 38.411$$

$$(1.9, 38.411)$$

$$t = 2.1$$

$$h = -4.9(2.1)^2 + 29(2.1) + 1$$

$$h = -4.9(4.41) + 60.9 + 1$$

$$h = -21.609 + 60.9 + 1$$

$$h = 40.291$$

$$(2.1, 40.291)$$

$$\begin{aligned} \overline{IROC} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{40.291 - 38.411}{2.1 - 1.9} \\ &= \frac{1.88}{0.2} \\ &= 9.4 \text{ m/s} \end{aligned}$$