Warm Up

$m = \frac{y_2 - y_1}{x_2 - x_1}$

Given that $f(x) = -2(x - 3)^3 + 1$, determine the slope of the secant that connects the points where x = -1 and x = 4 on this function.

$(-1, y_2)$

f(-1) ⇒ "This will give the y-value when x = -1"

$(4, y_1)$

$f(-1) = -2(-1-3)^3 + 1$

$f(-1) = -2(-4)^3 + 1$

$f(-1) = -2(-64) + 1$

$f(-1) = 128 + 1$

$f(-1) = \underline{129}$

$(-1, 129)$

$f(4) = -2(4-3)^3 + 1$

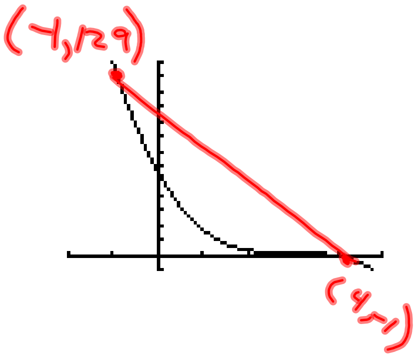
$= -2(1)^3 + 1$

$= -2 + 1$

$f(4) = -1$

$(4, -1)$

$m = \frac{129 + 1}{-1 - 4} = \frac{130}{-5} = -26$



Average Rate of Change (AROC)

- rates of change describe how one variable is changing in relation to another.

$$\boxed{AROC = \frac{f(b)-f(a)}{b-a}}$$

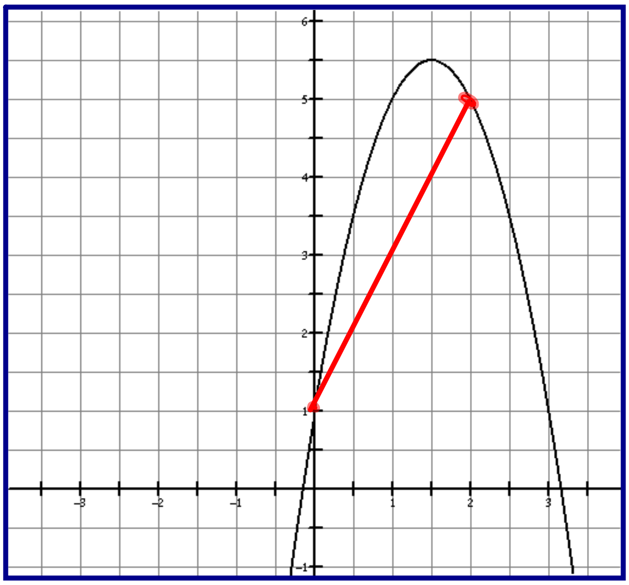
slope

$$AROC = \frac{\Delta y}{\Delta x}$$

- To find slope (linear function)...
  Need TWO points from an equation, graph or table.

EXAMPLE: Determine the average rate of change from t = 0 to t = 2 seconds given...

(t, h) $\qquad h(t) = -2t^2 + 6t + 1$ $\qquad h \Rightarrow$ metres, $t \Rightarrow$ time (sec)



$h(0) = 1 \Rightarrow (0,1)$

$h(2) = -2(2)^2 + 6(2) + 1$
$= -8 + 12 + 1$
$= 5$
$\Rightarrow (2,5)$

$m = \frac{5-1}{2-0} = \frac{4}{2} = 2$

- **AROC is found by calculating the slope of a secant.**
  (a line that goes through two points on a curve)

NOTE: **AROC > 0 (increasing function)**
AROC < o (decreasing function)

Average Rate of Change...

1) **Complete the following worksheet...**

   Worksheet - Intro. to Average Rate of Change.doc

2) **Read page 76 and get a sense for the focus of this unit and how it pertains to Mr. Lam. Look over the data on page 76 and use to answer question 6 on page 76.**

Practice Sheet

#1 $\left.\begin{array}{l}(0, 12345) \\ (6, 13100)\end{array}\right\}$ (h, km)

$$ARC = \frac{13100 - 12345}{6 - 0} \frac{km}{h}$$

$$ARC = \underline{125.8\ km/h}$$

#3) a) \$20 → \$25 (Increase of \$5)

60 − 10

= 50 shirts

(b) $\left.\begin{array}{l}(\$20, 60) \\ (\$25, 50)\end{array}\right\}$ $ARC = \frac{60-50}{20-25} \frac{\text{shirts}}{\$} = \frac{10}{-5} = -2\ \text{shirts}/\$$

More of Mr. Lam's data has just surfaced. The following, adds on to what we already have:

Minutes	Kilometres
80	110
90	135
100	150
110	155

-25, -15, -5
10, 10

As a review of work from our first unit, examine these values and decide what the levels of differences tell you about this data?

Enter the data from this final table, into two different lists in you graphics calculator, and use what you have just seen, concerning the level of differences, to do an appropriate regression and:

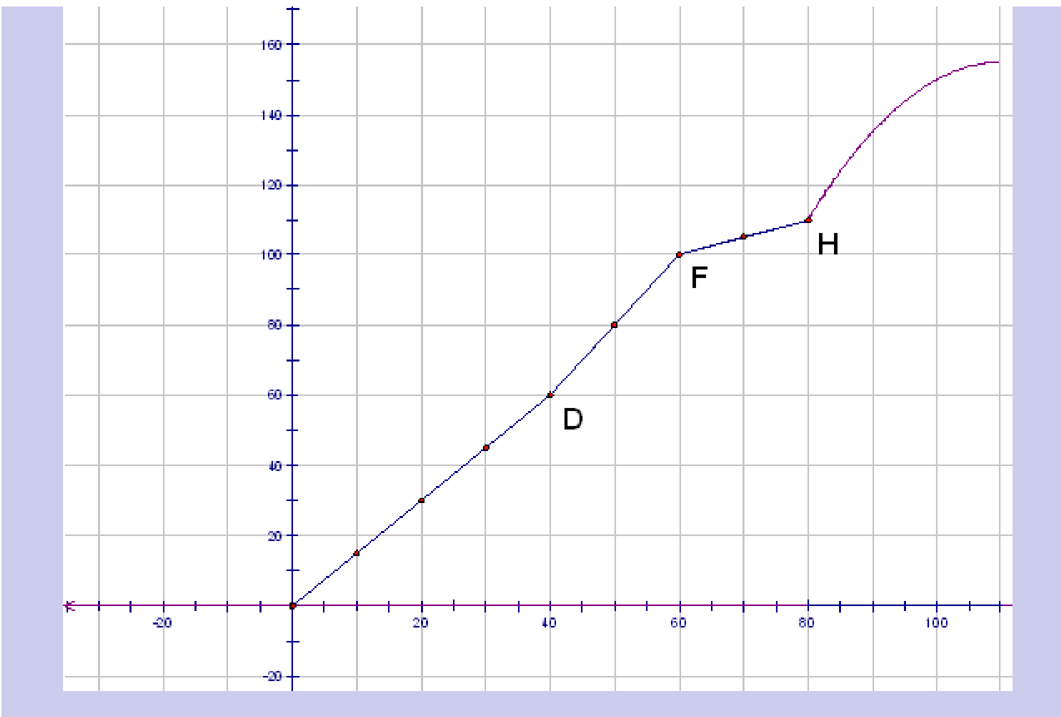
- Find an equation that fits these four ordered pairs. ✓
- Use the equation to find out how far he had traveled after 105 minutes.
- Find his average speed between 80 and 100 minutes in km/hr.
- Find his average speed between 100 and 105 minutes in km/hr.

$\frac{150-110 \text{ Km}}{100-80 \text{ min}} = \frac{40}{20} = 2 \text{ km/min} = 120 \text{ km/h}$

Solutions...

- The equation is $d = -0.5t^2 + 11t - 450$, where d = distance in kilometers and t = time in minutes. You may have used different variables; that's not a problem.
- If we substitute t = 105 into the equation, we get $d = -0.5(105)^2 + 11(105) - 450 = 153.75$ km.
- Over the twenty minutes from 80 to 100, he traveled 40 km: that's 2 km/min or 120 km/hr.
- Over the five minutes from 100 to 105 minutes, he traveled 3.75 km: that's $\boxed{\frac{3.75}{5} \text{ km/min} = .75 \text{ km/min} = 45 \text{ km/hr}}$. Remember, to change from km/min to km/hr, you need to multiply by 60, since there are 60 minutes in an hour.

Close



Attachments

Worksheet - Intro. to Average Rate of Change.doc