AVERAGE RATES OF CHANGE

Note Title 2/13/2009

DEFINITION - THE AVERAGE RATE OF CHANGE OF y WITH RESPECT TO x AS x GOES FROM x_1 TO x_2, IS THE RATIO IN THE CHANGE IN THE OUTPUT TO THE CHANGE IN THE INPUT

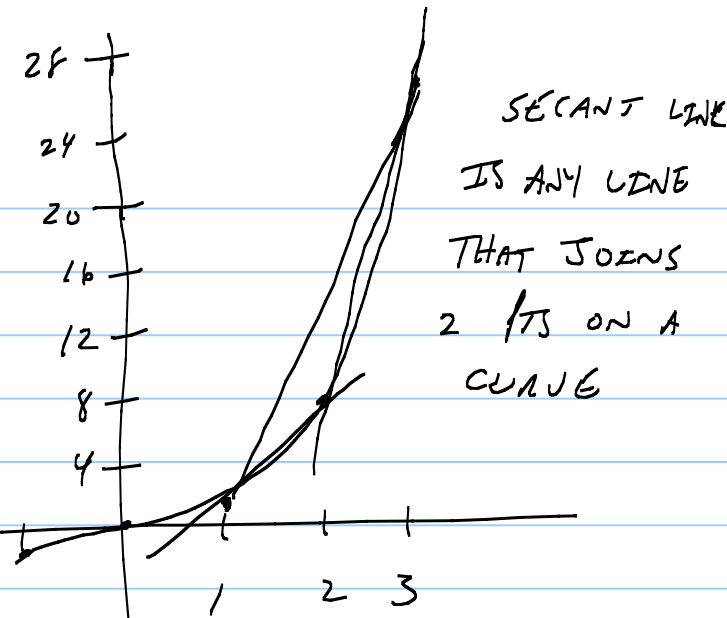
$$\frac{y_2 - y_1}{x_2 - x_1}$$

EX GIVEN $f(x) = x^3$ FIND THE AVG. RATE OF CHANGE AS x CHANGES

A) 1 TO 3

B) 1 TO 2

C) 2 TO 3



SECANT LINE IS ANY LINE THAT JOINS 2 PTS ON A CURVE

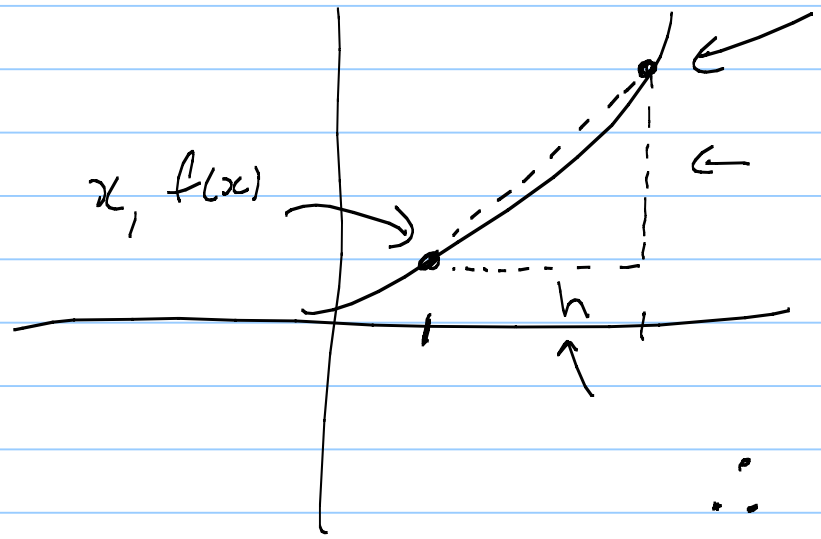
SOLN A) $\frac{27-1}{3-1} = \frac{26}{2} = 13$

B) $\frac{8-1}{2-1} = \frac{7}{1} = 7$

C) $\frac{27-8}{3-2} = \frac{19}{1} = 19$

x	y
0	0
1	1
2	8
3	27

DIFFERENCE QUOTIENTS



$x+h,\ f(x+h)$

$\therefore\ x_2 = x+h,\ x_1 = x$

$y_2 = f(x+h)\ \ y_1 = f(x)$

$\therefore$ AVERAGE RATE OF CHANGE IS

$$= \frac{f(x+h) - f(x)}{x+h - x}$$

$$= \frac{f(x+h) - f(x)}{h}$$

IE GIVEN $f(x) = x^2 + 2x$, FIND THE DIFFERENCE QUOTIENT FOR $x = 2$ AND

$h = 4$
$h = 1$
$h = .9$
$h = .1$
$h = .01$
$h = .001$

SOLN

$$\frac{f(x+h) - f(x)}{h}$$

$$f(x+h) = (x+h)^2 + 2(x+h)$$

$$x^2 + 2xh + h^2 + 2x + 2h$$

$$\frac{\cancel{x^2} + 2xh + h^2 \cancel{+ 2x} + 2h - (\cancel{x^2} \cancel{+ 2x})}{h}$$

$$\frac{2xh + h^2 + 2h}{h}$$

$$\frac{h(2x + h + 2)}{h}$$

$$2x + h + 2$$

HW

Pg 109 # 1, 5, 7, 14, 28

Pg 100 # 1-16, 23, 24 ALL
31-45 ODD

} ULD