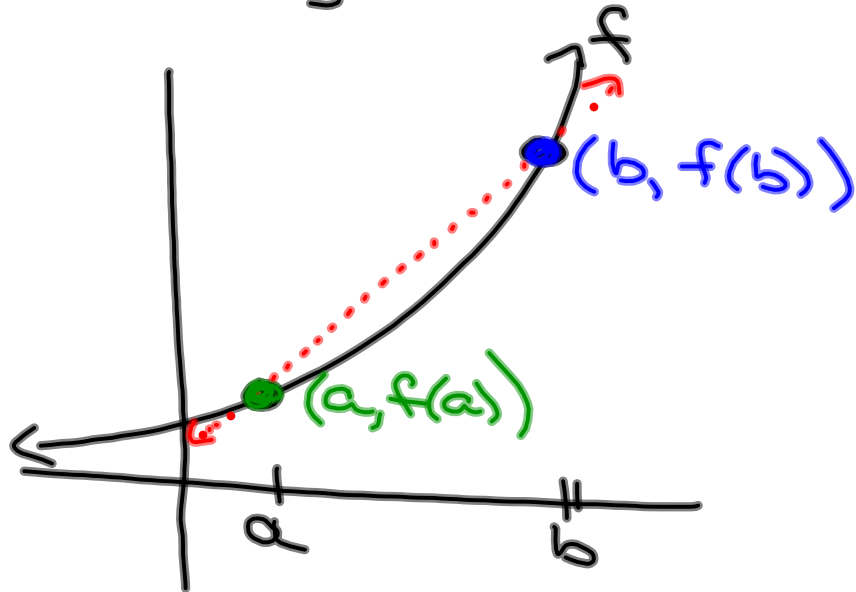


Sept. 30, 2013

Sect. 3-2b

Average Rate of Change }  
Difference Quotient } Slope

# Average Rate of Change (AROC)



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

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

Given  $f(x) = 3x^2 - 1$   
Find ARoC from 2 to 5.

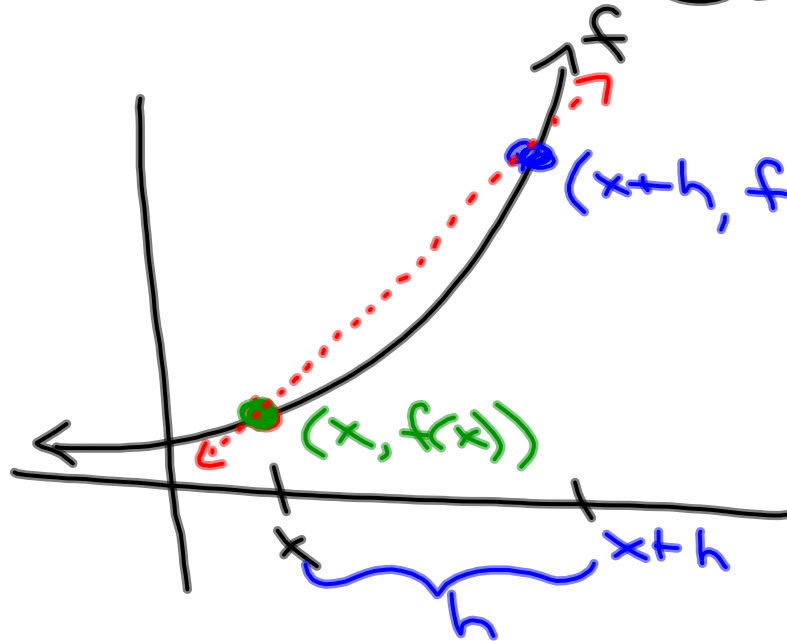
$$\text{ARoC} = \frac{f(b) - f(a)}{b - a}$$

$$f(5) = 3(5)^2 - 1 = 74$$

$$f(2) = 3(2)^2 - 1 = 11$$

$$\text{ARoC} = \frac{74 - 11}{5 - 2} = \frac{63}{3} = 21$$

## Difference Quotient (DQ)



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

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

$$f(x) = x^2 + 1$$

Find DQ of  $f$ .

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

$$\begin{aligned} f(x+h) &= (x+h)^2 + 1 && (x+h)(x+h) \\ &= x^2 + 2xh + h^2 + 1 \end{aligned}$$

$$\begin{aligned} DQ &= \frac{[x^2 + 2xh + h^2 + 1] - [x^2 + 1]}{(x+h) - (x)} \\ &= \frac{2xh + h^2}{h} = \frac{h(2x+h)}{h} = 2x+h \end{aligned}$$