

Notes Section 1.1 and 1.4 - Difference Quotient
and average rate of change

difference quotient

• find $\frac{f(a+h) - f(a)}{h}$

1. $f(x) = 6x + 4$

$$\frac{6(a+h) + 4}{h} - \frac{6a + 4}{h} = \frac{6a + 6h + 4 - 6a - 4}{h} = \frac{6h}{h} = \boxed{6}$$

2. $f(x) = x^2 - 4x + 7$

$$\frac{[(a+h)^2 - 4(a+h) + 7] - [a^2 - 4a + 7]}{h}$$

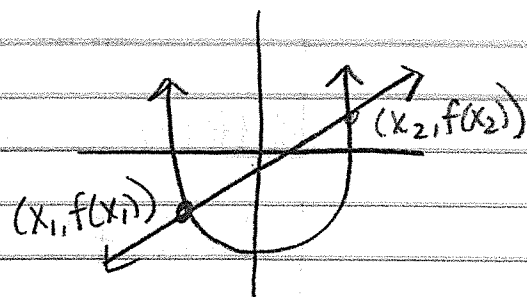
$$= \frac{[a^2 + 2ah + h^2 - 4a - 4h + 7] - [a^2 + 4a - 7]}{h}$$

$$= \frac{2ah + h^2 - 4h}{h} = \frac{h(2a + h - 4)}{h}$$

$$= \boxed{2a + h - 4}$$

average rate of change

$$\frac{f(x_2) - f(x_1)}{x_2 - x_1}$$



• find the average rate of change

1. $f(x) = -2x^2 + 4x + 6$

a. $[-3, -1]$

$$f(-3) = -2(-3)^2 + 4(-3) + 6 = -24$$

$$f(-1) = -2(-1)^2 + 4(-1) + 6 = 0$$

$$\frac{f(-1) - f(-3)}{-1 - (-3)} = \frac{0 - (-24)}{-1 + 3} = \frac{0 + 24}{2} = \boxed{12}$$

b. $[2, 5]$

$$f(5) = -2(5)^2 + 4(5) + 6 = -24$$

$$f(2) = -2(2)^2 + 4(2) + 6 = 6$$

$$\frac{f(5) - f(2)}{5 - 2}$$

$$= \frac{-24 - 6}{5 - 2} = \frac{-30}{3} = \boxed{-10}$$