

Name: \_\_\_\_\_  
PC: Difference Quotients

Date: \_\_\_\_\_  
Ms. Loughran

Difference quotient is an expression of the form:

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

It represents the slope of the line between two points,  $(x, f(x))$  and  $(x+h, f(x+h))$ . It is going to be used in Calculus, so we need to get really comfortable with it.

Do Now: Question 1 part a only

1. Given  $f(x) = 4x^2$ , find the following and simplify.

$$f(2) = 4(2)^2 = 16$$

(a).  $f(x+h)$

$$\begin{aligned} &4(x+h)^2 \\ &4(x+h)(x+h) \\ &4(x^2 + xh + xh + h^2) \\ &4(x^2 + 2xh + h^2) \\ &4x^2 + 8xh + 4h^2 \end{aligned}$$

(b).  $f(x+h) - f(x)$

$$\begin{aligned} &4x^2 + 8xh + 4h^2 - 4x^2 \\ &8xh + 4h^2 \end{aligned}$$

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

$$\begin{aligned} &\frac{\cancel{4}(8x+4h)}{\cancel{4}h} \\ &8x+4h \end{aligned}$$

# Homework 10-01

Name: \_\_\_\_\_  
PC: Evaluating Functions

Date: \_\_\_\_\_  
Ms. Loughran

Evaluate each function.

1)  $h(t) = |t + 2| + 3$ ; Find  $h(6)$

2)  $g(a) = 3^{3a-2}$ ; Find  $g(1)$

3

3)  $w(t) = -2t + 1$ ; Find  $w(-7)$

4)  $g(x) = 3x - 3$ ; Find  $g(-6)$

-21

5)  $h(n) = -2n^2 + 4$ ; Find  $h(4)$

6)  $h(t) = -2 \cdot 5^{-t-1}$ ; Find  $h(-2)$

$-2 \cdot 5^{2-1} = -2 \cdot 5 = -10$

7)  $f(x) = x^2 - 3x$ ; Find  $f(-8)$

8)  $p(a) = -4^{3a}$ ; Find  $p(-1)$

$-\frac{1}{64}$

9)  $p(t) = 4t - 5$ ; Find  $p(t - 2)$

10)  $g(a) = 4a$ ; Find  $g(2a)$

8a

11)  $w(n) = 4n + 2$ ; Find  $w(3n)$

12)  $w(a) = a + 3$ ; Find  $w(a + 4)$

a + 7

13)  $h(x) = 4x - 2$ ; Find  $h(x + 2)$

14)  $k(a) = -4^{3a+2}$ ; Find  $k(a - 2)$

$-4^{3a-4}$

15)  $g(n) = n^3 - 5n^2$ ; Find  $g(-4n)$

16)  $f(n) = n^2 - 2n$ ; Find  $f(n^2)$

$n^4 - 2n^2$

17)  $p(a) = a^3 - 5$ ; Find  $p(x - 4)$

18)  $h(t) = 2 \cdot 3^{t+3}$ ; Find  $h(4 + t)$

$2 \cdot 3^{7+t}$

2. Given  $f(x) = 2x^2 - x$ , find the following and simplify.

(a).  $f(x+h)$

$$\begin{aligned} & 2(x+h)^2 - (x+h) \\ & 2(x^2 + 2xh + h^2) - x - h \\ & 2x^2 + 4xh + 2h^2 - x - h \end{aligned}$$

(b).  $f(x+h) - f(x)$

$$\begin{aligned} & 2x^2 + 4xh + 2h^2 - x - h - (2x^2 - x) \\ & \cancel{2x^2} + 4xh + 2h^2 - \cancel{x} - h - \cancel{2x^2} + \cancel{x} \\ & 4xh + 2h^2 - h \end{aligned}$$

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

$$\begin{aligned} & \frac{4xh + 2h^2 - h}{h} \\ & 4x + 2h - 1 \end{aligned}$$

3. Given  $f(x) = 9 - \frac{1}{2}x^2$ , find the following and simplify.

(a).  $f(x+h)$

$$\begin{aligned} & 9 - \frac{1}{2}(x+h)^2 \\ & 9 - \frac{1}{2}(x^2 + 2xh + h^2) \\ & 9 - \frac{1}{2}x^2 - xh - \frac{1}{2}h^2 \end{aligned}$$

(b).  $f(x+h) - f(x)$

$$\begin{aligned} & 9 - \frac{1}{2}x^2 - xh - \frac{1}{2}h^2 - (9 - \frac{1}{2}x^2) \\ & \cancel{9} - \cancel{\frac{1}{2}x^2} - xh - \frac{1}{2}h^2 - \cancel{9} + \cancel{\frac{1}{2}x^2} \\ & -xh - \frac{1}{2}h^2 \end{aligned}$$

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

$$\begin{aligned} & \frac{-xh - \frac{1}{2}h^2}{h} \\ & -x - \frac{1}{2}h \end{aligned}$$

4. Given  $f(x) = 1 - x^2$ , find and simplify  $\frac{f(x+h) - f(x)}{h}$ .

$$\begin{aligned} & \frac{1 - (x+h)^2 - (1 - x^2)}{h} \\ & \frac{1 - (x^2 + 2xh + h^2) - 1 + x^2}{h} \\ & \frac{\cancel{1} - \cancel{x^2} - 2xh - h^2 - \cancel{1} + \cancel{x^2}}{h} \\ & \frac{-2xh - h^2}{h} \\ & -2x - h \end{aligned}$$

If you let  $h = 0$ , what does your answer become?

$$-2x - 0 = -2x$$

5. Given  $C(x) = 2x^2 - 4x + 3$ , find and simplify  $\frac{C(x+h) - C(x)}{h}$

$$\frac{2(x+h)^2 - 4(x+h) + 3 - (2x^2 - 4x + 3)}{h}$$
$$\frac{2(x^2 + 2xh + h^2) - 4x - 4h + 3 - 2x^2 + 4x - 3}{h}$$
$$\frac{\cancel{2x^2} + 4xh + 2h^2 - \cancel{4x} - 4h + \cancel{3} - \cancel{2x^2} + \cancel{4x} - \cancel{3}}{h}$$

If you let  $h = 0$ , what does your answer become?

$$\frac{4xh + 2h^2 - 4h}{h}$$

$$4x + 2h - 4$$

$$4x + 2(0) - 4 = 4x - 4$$

6. Given  $p(q) = q^2 + 2q - 5$ , find and simplify  $\frac{p(q+h) - p(q)}{h}$

$$\begin{aligned} & \frac{(q+h)^2 + 2(q+h) - 5 - (q^2 + 2q - 5)}{h} \\ & \frac{\cancel{q^2} + 2qh + \cancel{h^2} + \cancel{2q} + 2h - \cancel{5} - \cancel{q^2} - \cancel{2q} + \cancel{5}}{h} \\ & \frac{2qh + h^2 + 2h}{h} \\ & 2q + h + 2 \end{aligned}$$

If you let  $h = 0$ , what does your answer become?

$$\begin{aligned} & 2q + 0 + 2 \\ & 2q + 2 \end{aligned}$$