Math 109 College Algebra **Fall 2024**
Lecturer: Calvin Hotchkiss **TA: Samir Donmazov**
Group Worksheet 9

Indicate which group member is taking on which of the following four roles. You will switch roles on the next recitation day.

Reader: Reads the problem to the group and makes sure everyone understands.
Spokesperson: presents the work and asks questions to the TA.
Recorder: writes everyone's names and the group's work on the worksheet.
Timekeeper: keeps track of time.

Reader's name: _____

Spokesperson's name: _____

Recorder's name: _____

Timekeeper's name: _____

1. Let $f(x) = 2x^2 + 8$. Find the Average Rate of Change from $x = 1$ to $x = 3$. Simplify your answer.

$f_{AROC,[a,b]} = \frac{f(b) - f(a)}{b - a}$

$f_{AROC,[1,3]} = \frac{f(3) - f(1)}{3 - 1} = \frac{26 - 10}{2} = \frac{16}{2} = \boxed{8}$

$f(3) = 2 \cdot 3^2 + 8 = 2 \cdot 9 + 8 = 18 + 8 = 26$

$f(1) = 2 \cdot 1^2 + 8 = 2 + 8 = 10$

2. Suppose $f(x) = x^2 - 2$. What is the average rate of change of $f(x)$ on $[1, 1 + h]$?

$f_{AROC,[1,1+h]} = \frac{f(1+h) - f(1)}{(1+h) - 1} = \frac{(h^2 + 2h - 1) - (-1)}{h}$

$= \frac{h^2 + 2h}{h} = \frac{h(h+2)}{h} = \boxed{h + 2}$

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

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

3. Let $f(x) = 7x^2 + 4x - 18$. Find the average rate of change on the interval $[a, a+h]$ and simplify.

$$f_{AROC,\,[a,a+h]} = \frac{f(a+h)-f(a)}{(a+h)-a} = \frac{h(14a+7h+4)}{h} = \boxed{14a+7h+4}$$

$$f(a+h) = 7(a+h)^2 + 4(a+h) - 18$$
$$= 7(a^2+2ah+h^2) + 4(a+h) - 18$$
$$= 7a^2 + 14ah + 7h^2 + 4a + 4h - 18$$

$$f(a) = 7a^2 + 4a - 18$$

$$\Rightarrow f(a+h) - f(a) = (7a^2 + 14ah + 7h^2 + 4a + 4h - 18)$$
$$-(7a^2 + 4a - 18) = 14ah + 7h^2 + 4h$$

4. Find the equation of the line passing through the points $(3, -2)$ and $(1, 4)$.

Line equation: $y - y_1 = m(x - x_1)$ (1)

OR

$y = mx + b$ (2)

m: slope, b: y-intercept

Using (1) with $y_2 = 4$, $y_1 = -2$ and $x_2 = 1$, $x_1 = 3$,

$$y_2 - y_1 = 4 - (-2) = m(x_2 - x_1) = m \cdot (1-3)$$

$$\Rightarrow m = \frac{4-(-2)}{1-3} = \frac{6}{-2} = -3 \quad \text{(slope)}$$

Substituting "m" and one of given points, say $(3, -2)$ into (2): $-2 = -3 \cdot 3 + b \Rightarrow b = 9 - 2 = 7 \Rightarrow \boxed{y = -3x + 7}$