Project 1: Substitution

Substitution:

1. Suppose that there is a new algebraic operation called the arrow, and that it is defined this way:

$$\downarrow a = 2a - 1$$

Use this definition to write out the following expressions (no need to simplify afterwards!):

a) $\downarrow 2$

b) $\downarrow y^2$

c) $\downarrow (3x - 1)$

2. Suppose that there is a new algebraic operation called the smiley face, and that it is defined this way:

$$x☺ = \frac{1}{x}$$

Use this definition to write out the following expressions (no need to simplify afterwards!):

a) $2☺$

b) $y^2☺$

c) $(3x - y)☺$

d) $\frac{1}{z}☺$

3. Suppose that there is a new algebraic operation called the square, and that it is defined this way:

$$p \blacksquare q = pq - p^2$$

Use this definition to write out the following expressions (no need to simplify afterward!):

a) $-2 \blacksquare 3$

b) $x \blacksquare y^2$

c) $x^2 \blacksquare (y - 5)$

4. Now remember the way that function notation works. It can be used to define any kind of relationship between two or more variables, for example like this:

$$f(x) = 2x - 1$$
$$g(x) = \frac{1}{x}$$
$$h(x) = x - x^2$$

So, for example, $f(2 - x)$ would be equal to $2(2 - x) - 1$.

Given these function definitions, write out the following expressions:

a) $f(2)$

b) $f(3x - 1)$

c) $g(2)$

d) $g(2x)$

e) $h(-2)$

f) $h(3x - 1)$