2.1 #2 – p. 69 #'s 65, 69, 75

65.) $f(x) = \sqrt{x}$; $g(x) = 3x - 5$

$f+g = \sqrt{x} + 3x - 5 \quad \{x \mid x \geq 0\}$

$f-g = \sqrt{x} - (3x-5) = \sqrt{x} - 3x + 5 \quad \{x \mid x \geq 0\}$

$f \cdot g = \sqrt{x}(3x-5) = 3x\sqrt{x} - 5\sqrt{x} \quad \{x \mid x \geq 0\}$

$\frac{f}{g} = \frac{\sqrt{x}}{3x-5} \quad \{x \mid x \geq 0, x \neq \frac{5}{3}\}$

$\hookrightarrow 3x - 5 = 0 \rightarrow \frac{3x}{3} = \frac{5}{3} \rightarrow x = \frac{5}{3}$

69.) $f(x) = \frac{2x+3}{3x-2}$; $g(x) = \frac{4x}{3x-2}$

$f+g = \frac{2x+3}{3x-2} + \frac{4x}{3x-2} = \left(\frac{6x+3}{3x-2}, \{x \mid x \neq \frac{2}{3}\}\right)$

$f-g = \frac{2x+3}{3x-2} - \frac{4x}{3x-2} = \left(\frac{-2x+3}{3x-2}, \{x \mid x \neq \frac{2}{3}\}\right)$

$f \cdot g = \left(\frac{2x+3}{3x-2}\right)\left(\frac{4x}{3x-2}\right) = \frac{4x(2x+3)}{(3x-2)^2} = \left(\frac{8x^2+12x}{(3x-2)^2} \{x \mid x \neq \frac{2}{3}\}\right)$

$\frac{f}{g} = \frac{\frac{2x+3}{3x-2}}{\frac{4x}{3x-2}} = \frac{2x+3}{4x} \quad \{x \mid x \neq 0, \frac{2}{3}\}$

* when considering the domain of $\frac{f}{g}$, you have to include any domain restrictions that occur in f and g separately.

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

find $\dfrac{f(x+h) - f(x)}{h}$

- $f(x+h) = (x+h)^2 - (x+h) + 4 = x^2 + 2xh + h^2 - x - h + 4$
- $-f(x) = -(x^2 - x + 4) = -x^2 + x - 4$
- $h = h$

$$\frac{f(x+h) - f(x)}{h} = \frac{x^2 + 2xh + h^2 - x - h + 4 - x^2 + x - 4}{h}$$

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

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

$$= \boxed{2x + h - 1}$$