

2.1 Functions : CLASS Practice Solutions

1.) $f(x) = \frac{x^2 - 6}{x^2}$

a.) $f(x-2) = \frac{(x-2)^2 - 6}{(x-2)^2}$

b.) $f(3x) = \frac{(3x)^2 - 6}{(3x)^2}$

$= \frac{(x-2)^2 - 6}{(x-2)^2}$

$= \frac{(3x)^2 - 6}{(3x)^2}$

$= \frac{1 - \frac{6}{(x-2)^2}}{1}$

$= 1 - \frac{6}{(3x)^2}$

$= 1 - \frac{6}{9x^2} = \frac{1 - \frac{2}{3x^2}}{1}$

2.) Find the domain of each

a.) $g(x) = \frac{x}{x^2 - 5x + 6} = \frac{x}{(x-3)(x-2)}$

$D: \{x \mid x \neq 2, 3\}$

b.) $h(x) = \frac{|x|}{\sqrt{x}}$ $D: x > 0$

c.) $f(x) = \sqrt{10 - x}$ $D: \{x \mid x \leq 10\}$

3.) Find the difference quotient $\frac{f(x+h) - f(x)}{h}$

a.) $f(x) = -6x + 1$

$$\frac{-6(x+h) + 1 - (-6x + 1)}{h}$$

$$\frac{-6x - 6h + 1 + 6x - 1}{h}$$

$= \frac{-6h}{h} = \boxed{-6}$

b.) $2x^2 - 3x + 5$

$$\frac{2(x+h)^2 - 3(x+h) + 5 - (2x^2 - 3x + 5)}{h}$$

$$\frac{2x^2 + 4xh + 2h^2 - 3x - 3h + 5 - 2x^2 + 3x - 5}{h}$$

$$= \frac{2h^2 + 4xh - 3h}{h} = \boxed{2h + 4x - 3}$$

Find $f+g$, $f-g$, $f \cdot g$, $\frac{f}{g}$

4.) a.) $f(x) = 2x^2 + 3$; $g(x) = 4x^3 + 1$

$$f+g = (2x^2 + 3) + (4x^3 + 1) = 4x^3 + 2x^2 + 4$$

$$f-g = 2x^2 + 3 - (4x^3 + 1) = -4x^3 + 2x^2 + 2$$

$$f \cdot g = (2x^2 + 3)(4x^3 + 1) = 8x^5 + 2x^2 + 12x^3 + 3 = 8x^5 + 12x^3 + 2x^2 + 3$$

$$\frac{f}{g} = \frac{2x^2 + 3}{4x^3 + 1} \rightarrow 0 = 4x^3 + 1 \quad \text{D: } x \neq \sqrt[3]{-\frac{1}{4}}$$
$$\frac{-1}{4} = \frac{4x^3}{4}$$

b.) $f(x) = \frac{4}{x}$; $g(x) = \sqrt{x+1}$

$$f+g = \frac{4}{x} + \sqrt{x+1}; \{x \mid x \geq -1, x \neq 0\}$$

$$f-g = \frac{4}{x} - \sqrt{x+1}; \{x \mid x \geq -1, x \neq 0\}$$

$$f \cdot g = \left(\frac{4}{x}\right)(\sqrt{x+1}); \{x \mid x \geq -1, x \neq 0\}$$

$$\frac{f}{g} = \frac{4}{x \sqrt{x+1}}; \{x \mid x > -1, x \neq 0\}$$

5.) $f(x) = \frac{2x - B}{3x + 4}$ + $f(2) = \frac{1}{2}$, what is B?

$$\frac{1}{2} = \frac{2(2) - B}{3(2) + 4} \rightarrow \frac{1}{2} = \frac{4 - B}{10}$$

$$10 = 2(4 - B) \Rightarrow 10 = 8 - 2B$$

$$2B = 8 - 10$$

$$\frac{2B}{2} = \frac{-2}{2}$$

$$B = -1$$