

INTERMEDIATE ALGEBRA

GPS # 24

6.1 RATIONAL FUNCTIONS AND EQUATIONS

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Useful Guidelines:

* Fundamental Property of Rational Numbers

If $\frac{a}{b}$ is a rational number and if c is any nonzero real number, then $\frac{a}{b} = \frac{ac}{bc}$. $\frac{0}{0} = 0$, $\frac{3}{0}$, undefined so, domain can't be 0. *no Good! No!*

(The numerator a and the denominator b above may be multiplied and divided by the same nonzero number c without changing the value of the rational number $\frac{a}{b}$.)

* Writing a Rational Expression in Lowest Terms: Factor both numerator and denominator to find their Greatest Common Factor and apply the Fundamental Property.

1. Evaluate $f(x)$ numerically for the given value of x .

a) $f(x) = \frac{5x}{x^2 - 25}, x = 3$

$$f(3) = \frac{5 \cdot 3}{3^2 - 25} = \frac{15}{9 - 25} = -\frac{15}{16}$$

b) $f(x) = \frac{x}{36 - x^2}, x = 6$

$$f(6) = \frac{6}{36 - 6^2} = \frac{6}{36 - 36} = \frac{6}{0} = \text{undefined}$$

2. Write each rational expression in lowest terms.

a) $\frac{x-2}{2x^2-8}$

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

$$= \frac{1}{2(x+2)}$$

b) $\frac{2x+6}{(x-3)(x+3)}$

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

3. Find the domain of the rational function.

a) $f(x) = \frac{x+4}{x^2-16}$

$$= \frac{(x+4)}{(x-4)(x+4)}$$

$$= \frac{1}{x-4}$$

$$D = (-\infty, 4) \cup (4, \infty)$$

$$D: \{x \mid x \neq 4\}$$

b) $f(x) = \frac{x-7}{x^2-1}$

$$= \frac{x-7}{(x-1)(x+1)}$$

$$D: (-\infty, -1) \cup (-1, 1) \cup (1, \infty)$$

$$D: \{x \mid x \neq -1 \text{ or } x \neq 1\}$$

4. Solve the rational equation.

a) $\frac{x}{x-5} + 1 = -6$

$$\frac{x}{x-5} = -6 - 1 \quad (-7)$$

$$(x-5) \left[\frac{x}{x-5} \right] = (-7)(x-5)$$

$$x = -7x + 35$$

$$x + 7x = 35$$

$$8x = 35$$

$$x = \frac{35}{8}$$

b) $\frac{x+2}{x+2} = \frac{6x}{x+2}$

$$x-1 = 6x$$

$$x - 6x = 1$$

$$-5x = 1$$

$$x = -\frac{1}{5}$$