

Name **Key** Date Period

Pre-Calculus Unit 3 Practice Test

The entire test will be non-calculator.

Learning Target 3A—I can simplify rational expressions and solve rational equations.

Learning Target 3B—I can graph basic rational functions and identify their asymptotes.

Learning Target 3C—I can graph advanced rational functions and identify their asymptotes.

1. Simplify the following.

a. $\frac{x}{x+2} - \frac{x^2}{x^2-2x-8}$

$$\frac{x}{x+2} - \frac{x^2}{(x-4)(x+2)} = \frac{x(x-4) - x^2}{(x-4)(x+2)} = \frac{x^2 - 4x - x^2}{(x-4)(x+2)} = \frac{-4x}{x^2 - 2x - 8}$$

b. $\frac{2}{x} - \frac{3}{2} + \frac{x-1}{x+2}$

$$\frac{2(2)(x+2) - 3x(x+2) + (x-1)(2x)}{2x(x+2)} = \frac{4x+8 - 3x^2 - 6x + 2x^2 - 2x}{2x(x+2)} = \frac{-x^2 - 4x + 8}{2x^2 + 4x}$$

c. $\frac{2}{x+1} - \frac{3}{x-1} + \frac{5}{x^2-1}$

$$\frac{2(x-1) - 3(x+1) + 5}{(x+1)(x-1)} = \frac{2x-2 - 3x-3 + 5}{(x+1)(x-1)} = \frac{-x}{x^2-1}$$

2. Solve the following.

a. $\frac{5}{x-3} + \frac{2}{x+3} = \frac{9}{x^2-9}$

$$\begin{aligned}\frac{5}{x-3} + \frac{2}{x+3} &= \frac{9}{x^2-9} \\ \frac{5}{x-3} + \frac{2}{x+3} &= \frac{9}{(x-3)(x+3)} \\ 5(x+3) + 2(x-3) &= 9 \\ 5x + 15 + 2x - 6 &= 9 \\ 7x + 9 &= 9 \\ 7x &= 0 \\ x &= 0\end{aligned}$$

b. $\frac{x}{x+1} - \frac{x}{x^2-4x-5} = \frac{1}{x-5}$

$$\begin{aligned}\frac{x}{x+1} - \frac{x}{(x-5)(x+1)} &= \frac{1}{x-5} \\ x(x-5) - x &= 1(x+1) \\ x^2 - 5x - x &= x + 1 \\ x^2 - 6x &= x + 1 \\ x^2 - 7x - 1 &= 0 \\ \frac{7 \pm \sqrt{(-7)^2 - 4(1)(-1)}}{2(1)} &= \frac{7 \pm \sqrt{49 + 4}}{2} = \frac{7 \pm \sqrt{53}}{2} \\ x &= \frac{7 \pm \sqrt{53}}{2}\end{aligned}$$

c. $\frac{x^2}{x+4} + \frac{x-4}{x^2} = \frac{1}{x+4}$

$$\begin{aligned}x^2(x^2) + (x-4)(x+4) &= x^2 \\ x^4 + x^2 - 16 &= x^2 \\ x^4 - 16 &= 0 \\ (x^2 - 4)(x^2 + 4) &= 0 \\ x^2 - 4 &= 0 \\ x^2 &= 4 \\ x &= \pm 2 \\ x^2 + 4 &= 0 \\ x^2 &= -4 \\ x &= \pm 2i \\ x &= -2, 2, 2i, -2i\end{aligned}$$

Graph the following functions. Be sure to identify any hole(s), intercept(s), asymptote(s), and the domain.

$$3. f(x) = \frac{2x^2 - 7x - 4}{x^2 - 2x - 8} = \frac{(2x+1)(x-4)}{(x-4)(x+2)}$$

Hole: $x = 4$

x-intercept: $2x + 1 = 0$ so

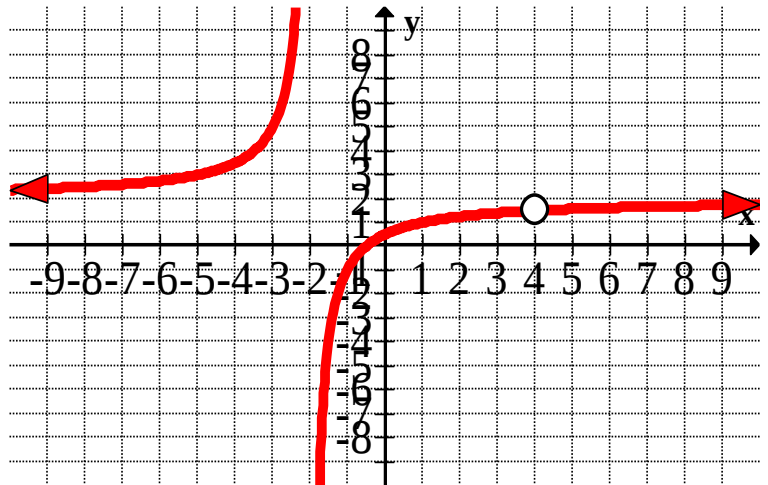
$$x = -\frac{1}{2} \text{ or } (-\frac{1}{2}, 0)$$

y-intercept: $\frac{2(0)+1}{0+2} = \frac{1}{2}$ or $(0, \frac{1}{2})$

VA: $x = -2$

HA: $y = 2$

Domain: $\{x|x \neq -2, 4, x \in \mathbb{R}\}$



$$4. g(x) = \frac{1}{x^2 - 1}$$

Factored Form: $\frac{1}{(x+1)(x-1)}$

Hole: none

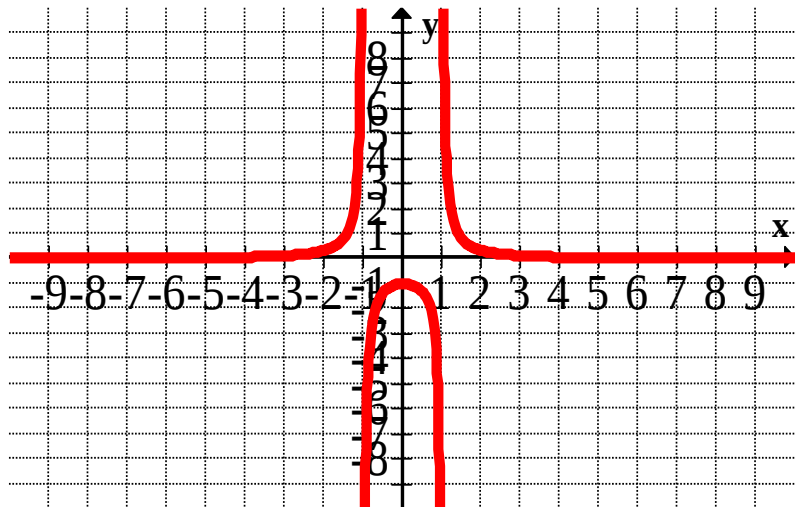
x-intercept: none

y-intercept: $\frac{1}{(0+1)(0-1)} = \frac{1}{-1} = -1$

VA: $x = 1$ and $x = -1$

HA: $y = 0$

Domain: $\{x|x \neq -1, 1, x \in \mathbb{R}\}$



5. $h(x) = \frac{x^2+3x-10}{x}$

Factored Form: $\frac{(x+5)(x-2)}{x}$

Hole: none

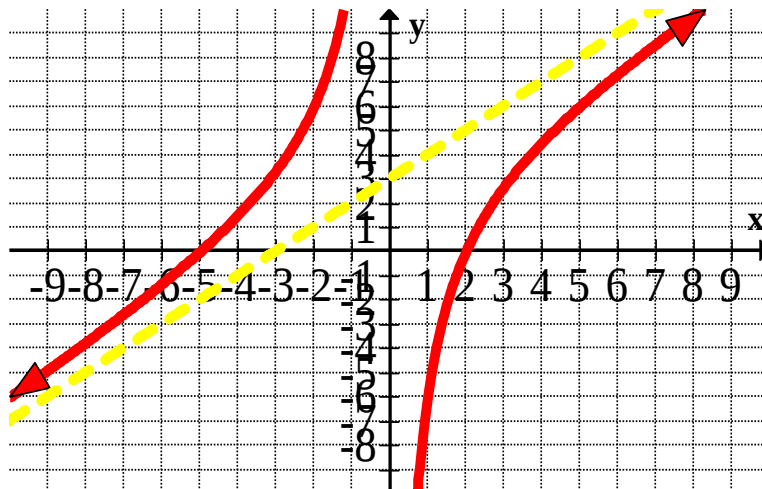
x-intercepts: $(-5, 0)$ and $(2, 0)$

y-intercept: *none*

VA: $x = 0$

Slant: $y = x + 3$

Domain: $\{x | x \neq 0, x \in \mathbb{R}\}$



6. $j(x) = \frac{x^2+x-12}{x^2-8x-9}$

Factored Form: $\frac{(x+4)(x-3)}{(x-9)(x+1)}$

Hole: none

x-intercepts: $(-4, 0)$ and $(3, 0)$

y-intercept: $-\frac{12}{-9} = \frac{4}{3}$ or $(0, 1.33)$

VA: $x = 9$ and $x = -1$

HA: $y = 1$

Domain: $\{x | x \neq 9, -1, x \in \mathbb{R}\}$

