

Key

Part A: Rational Algebraic Expressions [A-SSE.1, A-SSE.2]

1. **Simplify** the expressions by multiplying, adding, or subtracting. **Show** your work.

$$A) \left(\frac{3}{x+4} \right) \left(\frac{2x+1}{x-3} \right)$$

$$\frac{3(2x+1)}{(x+4)(x-3)}$$

$$\frac{6x+3}{x^2-3x+4x-12}$$

$$\frac{6x+3}{x^2+x-12}$$

$$\left(\frac{x-4}{x-4} \right) \frac{5}{x+2} + \frac{x}{x-4} \left(\frac{x+2}{x+2} \right)$$

$$\frac{5(x-4) + x(x+2)}{(x-4)(x+2)}$$

$$\frac{5x-20 + x^2+2x}{(x-4)(x+2)}$$

$$\frac{x^2+7x-20}{(x-4)(x+2)}$$

$$\left(\frac{x+5}{x+5} \right) \frac{x}{x-3} - \frac{x+1}{x+5} \left(\frac{x-3}{x-3} \right)$$

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

$$\frac{x^2+5x - (x^2-3x+x-3)}{x^2-3x+5x-15}$$

$$\frac{x^2+5x - (x^2-2x-3)}{x^2+2x-15}$$

$$\frac{x^2+5x - x^2+2x+3}{x^2+2x-15}$$

$$\frac{7x+3}{x^2+2x-15}$$

Part B: Rational Algebraic Functions [F-IF.4, F-BF.3]

2. **Graph** the function. **Identify** the intercept(s), asymptote(s), and end behavior.

$$f(x) = \frac{7}{x+3}$$

A) Intercept(s):

y-intercept
(0, 2) no x-intercepts

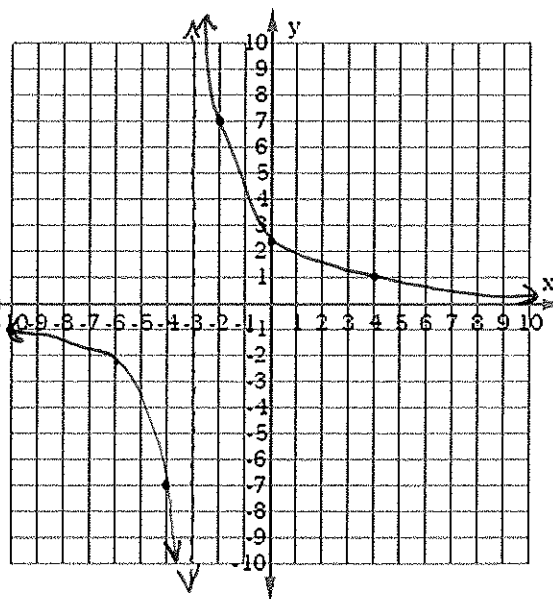
B) Asymptote(s):

horizontal asymptote $y=0$
vertical asymptote $x=-3$

C) End Behavior:

 $\text{as } x \rightarrow \infty, f(x) \rightarrow 0$
 $\text{as } x \rightarrow -\infty, f(x) \rightarrow 0$

x	f(x)
0	7/3
-3	undef.
4	1
-2	7
-4	-7



Part C: Rational Algebraic Equations [A-CED.2, A-REI.2]

3. **Determine** the value of x that makes the equation true. **Show** your work and **justify** your steps.

A) $\frac{16}{4} = \frac{12}{x}$ $16x = 48$ cross product $\div 16$ $\div 16$ division property $x = 3$ $\frac{16}{4} = \frac{12}{3}$ $4 = 4 \checkmark$ true	B) $\frac{x+4}{12} = \frac{6}{8}$ $8x+32 = 72$ cross product -32 -32 subtraction prop $8x = 40$ $\div 8$ $\div 8$ division prop $x = 5$ $\frac{9}{12} = \frac{6}{8} \checkmark$ true	C) $\frac{12}{2x-4} = \frac{3}{x-2} + 3\left(\frac{x-2}{x-2}\right)$ $\frac{12}{2x-4} = \frac{3+3x-6}{x-2}$ $12(x-2) = (2x-4)(3x-3)$ $12x-24 = 6x^2-6x-12x+12$ $-12x$ $-12x$ $-24 = 6x^2-30x+12$ $+24$ $+24$ $0 = 6x^2-30x+36$ $\div 6$ $\div 6$ $0 = x^2-5x+6$ $0 = (x-3)(x-2)$ $x = 3$ true $x = 2$ false $\frac{12}{2} = \frac{3}{1} + 3 \checkmark$ $\frac{12}{0} = \frac{3}{0} + 3 \checkmark$
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4. Vanessa solved the equation. **Identify** and **explain** the first error Vanessa made, then **correct** her work.

$$\frac{x}{x+2} = \frac{3x-2}{x+6}$$

Step 1: $x(x+6) = (x+2)(3x-2)$ cross product $\checkmark$

Step 2: $x^2+6x = 3x^2+4x-4$ distributive property $\checkmark$

Step 3: $6x = 2x^2+4x-4$ subtraction $\checkmark$

→ Step 4: $0 = 2x^2 + \textcircled{2x} - 4$ subtraction (error)

Step 5: $0 = 2(x^2+x-2)$

Step 6: $0 = 2(x+2)(x-1)$

Step 7: $x = -2, x = 1$

Vanessa made an error in step 4 when they subtracted.

correct work: Step 4: $0 = 2x^2 - 2x - 4$ subtraction

Step 5: $0 = 2(x^2 - x - 2)$ factor

Step 6: $0 = 2(x-2)(x+1)$ factor

$x = 2$ true $x = -1$ true

$$\frac{2}{4} = \frac{4}{8} \checkmark$$

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