

1) Suppose that x varies directly with the square of y and inversely with the cube of z . When $x = 2$, $y = 8$, and $z = 4$. Write a function that models this relationship. Then find x when $y = 3$ and $z = -2$.

$$x = \frac{ky^2}{z^3}$$

$$2 = \frac{k(8)^2}{4^3}$$

$$x = \frac{2y^2}{z^3}$$

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

$$2 = \frac{64k}{64}$$

$$x = \frac{18}{-8} = -\frac{9}{4}$$

$$k = 2$$

3) Identify the EBA for the following functions:

a) $f(x) = \frac{(x-3)(2x-5)}{(3x+1)(4x+3)}$
 $= \frac{2x^2 \dots}{12x^2 \dots}$

$$y = \frac{1}{6}$$

b) $f(x) = \frac{(4x+5)}{(2x-3)(x-5)}$

$$y = 0$$

c) $f(x) = \frac{6x^3 + 4x^2 - 7}{2x^2 + 4}$

$$2x^2 + 4 \overline{) 6x^3 + 4x^2 - 7}$$

$$\underline{-6x^3 + 12x}$$

$$4x^2 - 12x - 7$$

$$\underline{-4x^2 + 8}$$

$$-12x - 15$$

$$y = 3x + 2$$

4) Simplify:

a) $\frac{2}{3x^2 - 27} - \frac{x}{2x^2 - 12x + 18}$
 $\frac{2}{3(x^2 - 9)} - \frac{x}{2(x^2 - 6x + 9)}$
 $\frac{2}{3(x-3)(x+3)} - \frac{x}{2(x-3)(x-3)}$

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

$$\frac{4x - 12 - 3x^2 - 9x}{6(x-3)^2(x+3)}$$

$$\frac{-3x^2 - 5x - 12}{6(x-3)^2(x+3)}$$

b) $\frac{x^2 - x - 12}{2x^4 - 8x^3} \cdot \frac{4x^2 - 28x}{3x^2 + 10x + 3}$

$$\frac{(x-4)(x+3)}{2x^3(x-4)} \cdot \frac{4x(x-7)}{(3x+1)(x+3)}$$

$$\frac{4(x-7)}{2x^2(3x+1)} \quad x \neq -4, -3$$

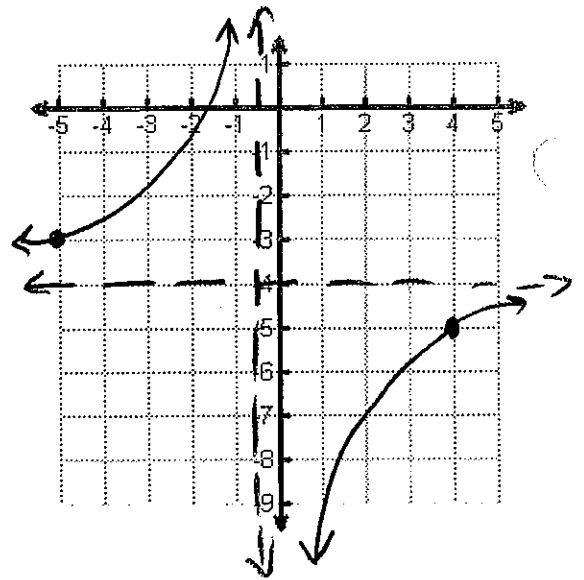
5) Graph each of the following:

a) $f(x) = \frac{-9}{2x+1} - 4$

VA $x = -\frac{1}{2}$

EBA $y = -4$

x	y
4	-5
-5	-3



b) $f(x) = \frac{(x+5)(x+2)}{(x^2+5x+6)(x-5)} \cdot \frac{3}{1(-7)}$
 ~~$\frac{x^2+7x+10}{(x^2+5x+6)(x-5)}$~~
 ~~$\frac{(x+3)(x+2)}{(x+3)(x+2)}$~~

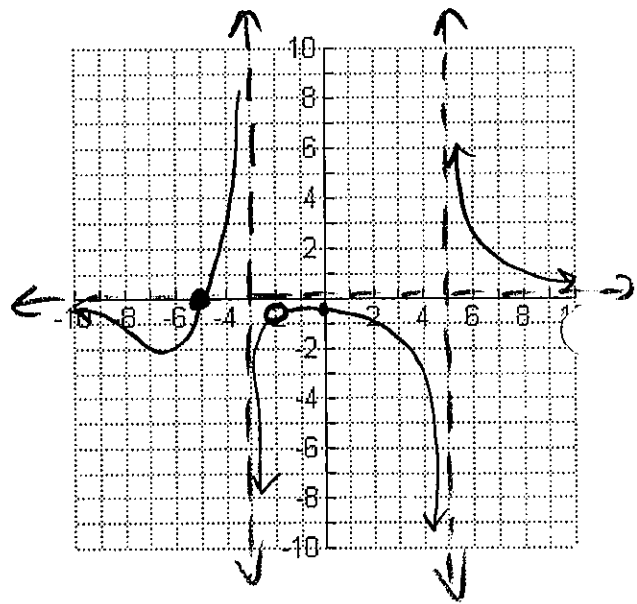
Hole @ $(-2, \frac{3}{-7})$

VA @ $x = -3$
 $x = 5$

EBA @ $y = 0$

x-int @ $(-5, 0)$

y-int @ $(0, \frac{-1}{3})$



c) $f(x) = \frac{2x^2-7x+5}{x-3} \cdot \frac{(2x-5)(x-1)}{x-3}$

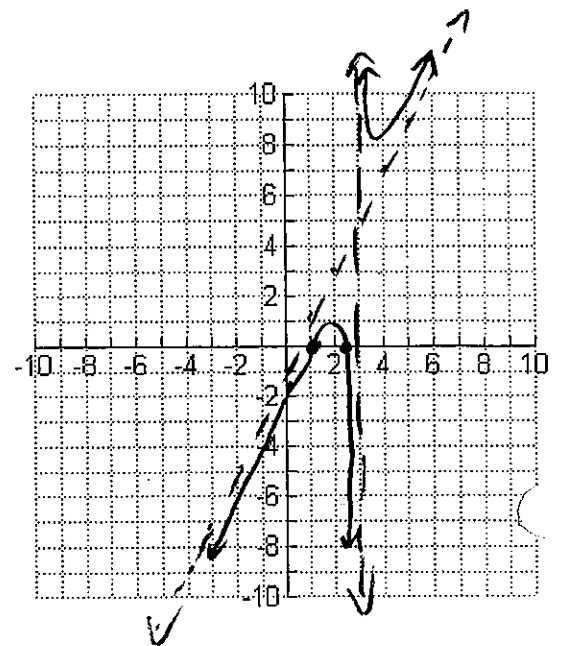
VA @ $x = 3$

EBA @ $y = 2x - 1$

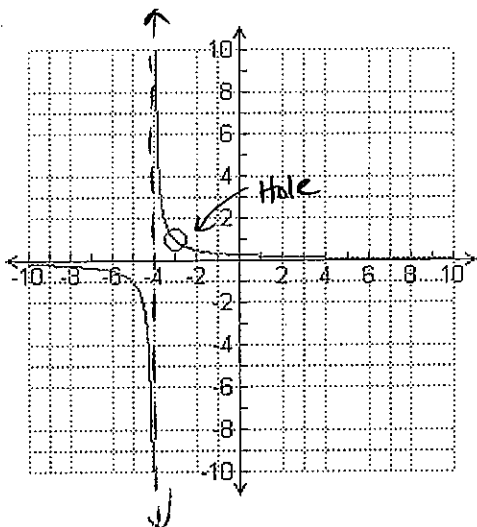
$$\begin{array}{r} 3 \overline{) 2 \ -7 \ 5} \\ \underline{6 \ 6 \ -3} \\ 2 \ -1 \ 2 \end{array}$$

x-int @ $(\frac{5}{2}, 0)$ and $(1, 0)$

y-int @ $(0, -\frac{5}{3})$



6) Identify the following and then write an equation for the graph below:



Domain: $(-\infty, -4) \cup (-4, -3) \cup (-3, \infty)$ Range: $(-\infty, 0) \cup (0, 1) \cup (1, \infty)$

Increasing: never

Decreasing: $(-\infty, -4) \cup (-4, -3) \cup (-3, \infty)$

Asymptotes:
 $x = -4$
 $y = 0$

Hole: $(-3, 1)$

Equation: $y = \frac{x+3}{(x+4)(x+3)}$

$\lim_{x \rightarrow \infty} f(x) = 0$

$\lim_{x \rightarrow -\infty} f(x) = 0$

$\lim_{x \rightarrow -4^-} f(x) = -\infty$

$\lim_{x \rightarrow -4^+} f(x) = \infty$

$\lim_{x \rightarrow -3} f(x) = \text{DNE}$

$\lim_{x \rightarrow -3} f(x) = 1$

7) Solve each of the following rational equations.

a) $\frac{7}{x^2-5x} + \frac{2}{x} = \frac{3}{2x-10}$ $x \neq 0$
 $x \neq 5$

$\frac{7(2)}{2x(x-5)} + \frac{2(2)(x-5)}{x(2)(x-5)} = \frac{3(x)}{2x(x-5)}$

$14 + 4x - 20 = 3x$

$-6 = -x$

$x = 6$

b) $\frac{x+3}{x^2+1} - \frac{2x}{x-1} = 1$ $x \neq 1, -1$
 $(x-1)(x+1)$

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

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

$-3x^2 - x + 4 = 0$

$3x^2 + x - 4 = 0$

$(3x+4)(x-1) = 0$

$x = -\frac{4}{3}$ $x \neq 1$

$$c) \frac{\frac{8x}{x+2}}{4} = \frac{x^2 + 11x + 10}{2} \quad x \neq -2$$

$$2x = \frac{x^2 + 11x + 10}{2}$$

$$4x = x^2 + 11x + 10$$

$$x^2 + 7x + 10 = 0$$

$$(x+5)(x+2) = 0$$

$$\boxed{x = -5} \quad x = -2$$

8) Ms. Strader has decided to take the class on a field trip and rented a bus for \$200. She must also pay \$10 per person for admission to the Museum of Science. The price per student will obviously depend upon the number of students that decide to go on the trip. Ms. Strader and the two other chaperones should not have to pay anything since they are technically working and the students must split their costs. Let x represent the number of students going on the field trip. Determine how many students must agree to go on the trip in order for the price to be...

a) \$15 per student $\frac{200 + 10(x+3)}{x} = 15$

$$230 + 10x = 15x$$

$$230 = 5x$$

$$x = \boxed{46 \text{ students}}$$

b) \$20 per student $\frac{200 + 10(x+3)}{x} = 20$

$$230 + 10x = 20x$$

$$230 = 10x$$

$$x = \boxed{23 \text{ students}}$$

c) \$ y per student $\frac{200 + 10(x+3)}{x} = y$

$$230 + 10x = xy$$

$$230 = xy - 10x$$

$$230 = x(y - 10)$$

$$x = \boxed{\frac{230}{y - 10} \text{ Students}}$$

9) Ms. Marcus has decided to rent a beach house for \$1000 for one week. She wants to let her 2 of her friends stay for free since they let her stay at their lake house last summer without paying. If x represents the number of people staying at the house, what would x need to be in order for the cost to be less than \$150 per person? (Note that those that are paying for the house would all be paying the same amount and the house can only sleep up to 12 people.)

$$\frac{1000}{x-2} < 150$$

$$\boxed{9 < x < 12}$$

$$1000 < 150x - 300$$

$$1300 < 150x$$

$$\frac{1300}{150} < x$$