

NAME: Key

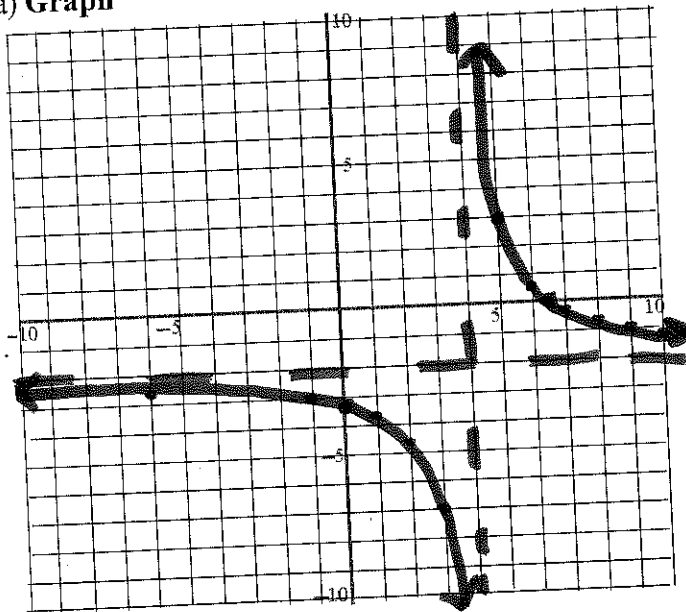
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5.2/5.3: Graphing Rational Functions

1. $f(x) = \frac{5}{x-4} - 2$

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

a) Graph



b) Domain: $x \neq 4$

c) Range: $y \neq -2$

d) Equations of Vertical Asymptote(s):

$x = 4$

e) Coordinates of any hole(s): none

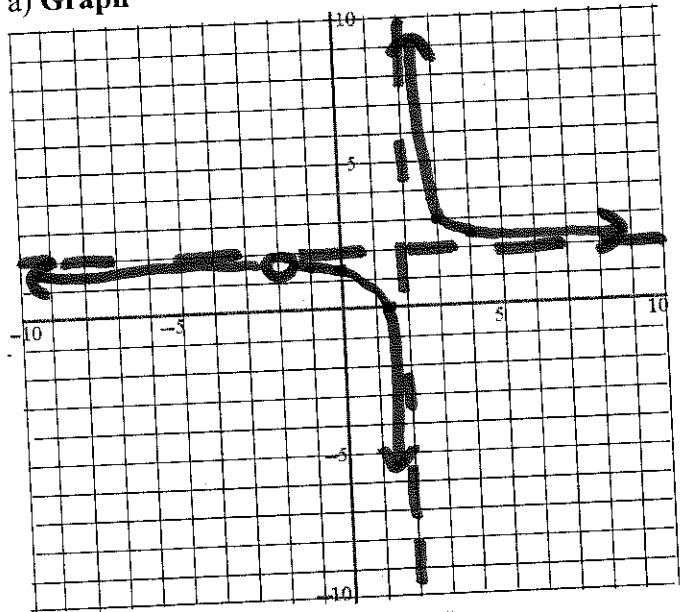
f) Equation of horizontal asymptote(s):

$y = -2$

g) Coordinates of the x-intercept(s): (6.5, 0)

h) Coordinates of the y-intercept: (0, -3.25)

a) Graph



b) Domain: $x \neq -2, 2$

c) Range: $y \neq 7/4, 2$

d) Equations of Vertical Asymptote(s):

$x = 2$

e) Coordinates of any hole(s): (-2, 7/4)

f) Equation of horizontal asymptote(s):

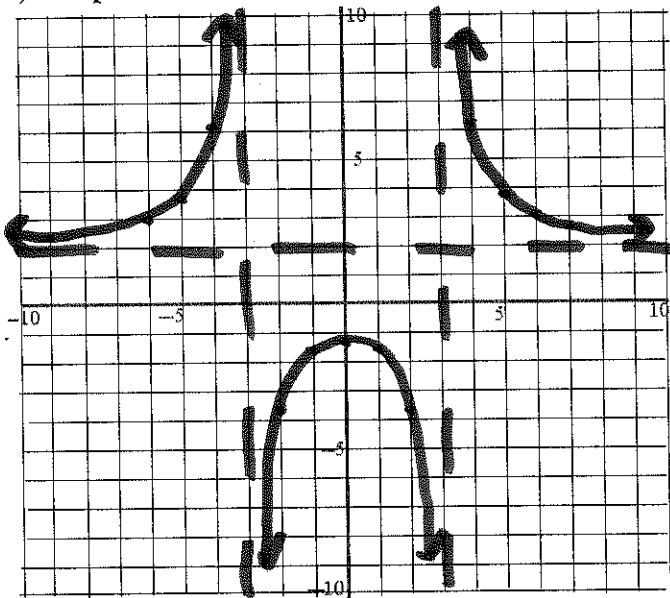
$y = 2$

g) Coordinates of the x-intercept(s): (1.5, 0)

h) Coordinates of the y-intercept: (0, 1.5)

3. $f(x) = \frac{2x^2 + 11}{x^2 - 9}$

a) Graph



b) Domain: $x \neq \pm 3$

c) Range: $y > 2$ $y \leq -1.2$

d) Equations of Vertical Asymptote(s):

$x = \pm 3$

e) Coordinates of any hole(s): none

f) Equation of horizontal asymptote(s):

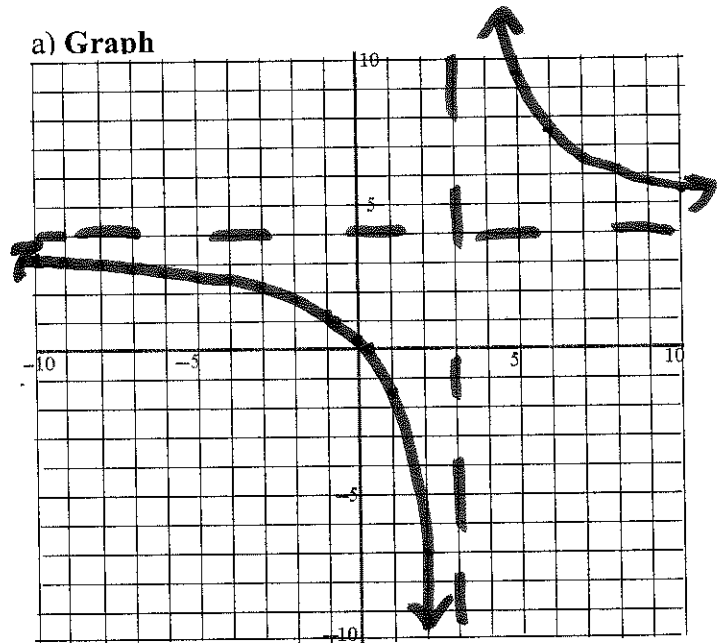
$y = 2$

g) Coordinates of the x-intercept(s): none

h) Coordinates of the y-intercept: $(0, -1.2)$

4. $f(x) = \frac{4x-1}{x-3}$

a) Graph



b) Domain: $x \neq 3$

c) Range: $y \neq 4$

d) Equations of Vertical Asymptote(s):

$x = 3$

e) Coordinates of any hole(s): none

f) Equation of horizontal asymptote(s):

$y = 4$

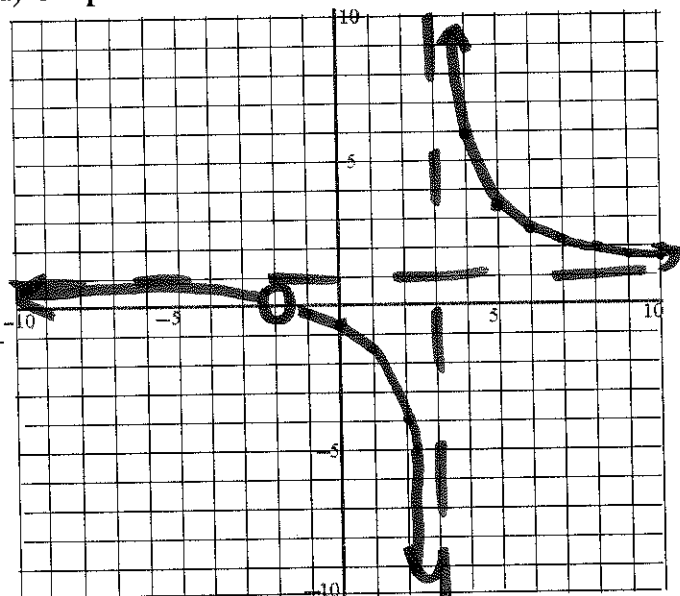
g) Coordinates of the x-intercept(s): $(.25, 0)$

h) Coordinates of the y-intercept: $(0, .3)$

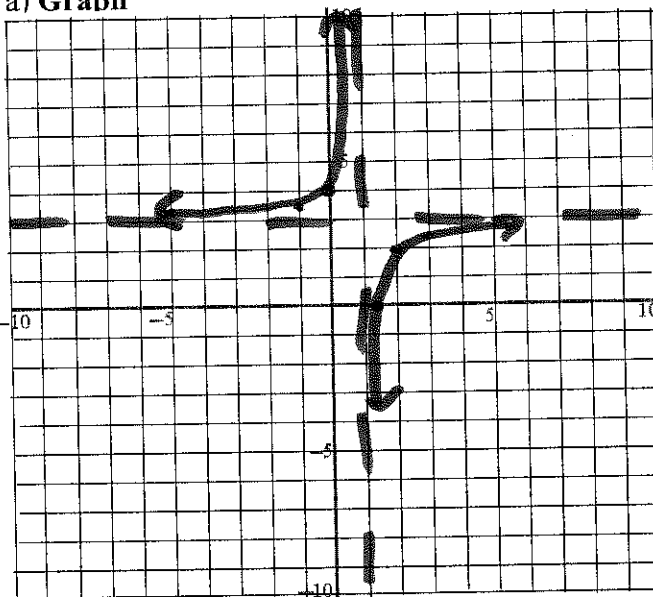
5. $f(x) = \frac{(x+2)^2}{x^2-x-6}$ $\frac{(x+2)(x+2)}{(x-3)(x+2)}$

6. $f(x) = \frac{3x-4}{x-1}$

a) Graph



a) Graph



b) Domain: $x \neq -2, 3$

b) Domain: $x \neq 1$

c) Range: $y \neq 0, 1$

c) Range: $y \neq 3$

d) Equations of Vertical Asymptote(s):
 $x = 3$

d) Equations of Vertical Asymptote(s):
 $x = 1$

e) Coordinates of any hole(s): $(-2, 0)$

e) Coordinates of any hole(s): none

f) Equation of horizontal asymptote(s):
 $y = 1$

f) Equation of horizontal asymptote(s):
 $y = 3$

g) Coordinates of the x-intercept(s): none

g) Coordinates of the x-intercept(s): $(\frac{4}{3}, 0)$

h) Coordinates of the y-intercept: $(0, -\frac{2}{3})$

h) Coordinates of the y-intercept: $(0, 4)$

5.4: Multiplying and Dividing Rational Expressions

Perform the indicated operation.

$$7. \frac{x^2 + 11x + 28}{2x^2 + 8x} = \frac{(x+7)(x+4)}{2x(x+4)} = \frac{x+7}{2x}$$

$$8. \frac{3x^2 - 15x}{3x} \cdot \frac{2x^2 - 10x}{x^2 - 10x + 25} = \frac{\cancel{3x}(x-5)}{\cancel{3x}} \cdot \frac{2x(x-5)}{(x-5)(x-5)} = 2x$$

$$9. \frac{x^2 + 11x + 30}{x^2 + 15x + 56} \cdot \frac{x^2 + 4x - 32}{3x^2 + 18x} = \frac{(x+6)(x+5)(x+8)(x-4)}{(x+7)(x+8)(3x)(x+6)} = \frac{(x+5)(x-4)}{(x+7)(3x)}$$

$$10. \frac{2x^8 y^2 z^5}{4x^3 z} \cdot \frac{5x^4 y^3 z}{16x^2 yz^8} = \frac{55x^{12} y^5 z^6}{32x^5 yz^9} = \frac{55x^7 y^4}{32z^3}$$

$$11. \frac{x^2}{x^2 - 1} \div \frac{3x^2 - x}{3x^2 - 4x + 1} = \frac{\cancel{x}(x+1)}{(x+1)\cancel{(x-1)}} \cdot \frac{(3x-1)\cancel{(x-1)}}{x(3x-1)} = \frac{x}{x+1}$$

$$12. (x^2 - 8x + 16) \div \frac{3x^2 - 6x - 24}{2x + 5} = \frac{3(x^2 - 2x - 8)(x-4)(x-4)(2x+5)}{1 \cdot 3(x-4)(x+2)} = \frac{(x-4)(2x+5)}{3(x+2)}$$

5.5: Adding and Subtracting Rational Expressions

Perform the indicated operation.

$$13. \frac{-5x+1}{17x} + \frac{-2x-4}{17x} = \frac{(-5x+1)+(-2x-4)}{17x} = \frac{-7x-3}{17x}$$

$$14. \frac{5x-2}{4x^2} + \frac{-3x+9}{4x^2} = \frac{(5x-2)+(-3x+9)}{4x^2} = \frac{2x+7}{4x^2}$$

$$15. \frac{\frac{(x-1)}{2x}}{(x-1)(x+1)} - \frac{\frac{(x+1)}{3x}}{(x+1)(x-1)} + \frac{6}{x^2-1} = \frac{(2x^2-2x) - (3x^2+3x) + (6)}{(x+1)(x-1)}$$

$$= \frac{-x^2-5x+6}{(x+1)(x-1)}$$

$$16. \frac{\frac{(x-1)}{x+4}}{(x-1)(x+1)(x+1)} + \frac{\frac{(x+1)}{x}}{(x+1)(x-1)} - \frac{2}{(x+1)(x+1)(x-1)} = \frac{(x^2+3x-4) + (x^2+x) - (2x^2+4x+2)}{(x+1)(x+1)(x-1)}$$

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

$$17. \frac{\frac{(x-2)}{3x-9}}{(x-2)(3)(x-3)} + \frac{\frac{5(3)}{x^2-5x+6}}{(x-3)(x-2)(3)} = \frac{(x^2-x-2) + (15)}{(3)(x-3)(x-2)} = \frac{x^2-x+13}{3(x-3)(x-2)}$$

$$18. \frac{\frac{2}{(2x+1)(x-3)}}{(x-3)(2x+1)} + \frac{\frac{x(3)}{2x+1}}{(3)(x-3)(2x+1)(x-3)} - \frac{\frac{x+1(3)}{2x^2-5x-3}}{(3)(x-3)(2x+1)(x-3)} = \frac{(4x^2-10x-6) + (3x^2-9x) - (x+3)}{3(2x+1)(x-3)}$$

$$= \frac{7x^2-22x-9}{3(2x+1)(x-3)}$$

5.6: Solving Rational Equations

Solve for x.

19. $\frac{x}{x-1} = \frac{x-4}{x+3}$

$(x)(x+3) = (x-4)(x-1)$
 $x^2 + 3x = x^2 - 5x + 4$
 ~~$x^2 + 5x$~~ ~~$x^2 + 5x$~~
 $\frac{8x}{8} = \frac{4}{8}$
 $x = 1/2$

20. $\frac{x+7}{x-3} = \frac{3}{1}$

$x+7 = 3x-9$
 ~~$-x+9$~~ ~~$-x+9$~~
 $\frac{16}{2} = \frac{2x}{2}$
 $x = 8$

21. $\frac{x}{x-2} = \frac{2}{x+2}$

$x^2 + 2x = 2x - 4$
 ~~$-2x+4$~~ ~~$-2x+4$~~
 $x^2 + 4 = 0$
 ~~-4~~ ~~-4~~
 $\sqrt{x^2} = \sqrt{-4}$
 $x = \pm 2i$
 no real solutions

22. $\frac{6}{x-5} - 4 = \frac{2}{x-5}$

$6 - (4x - 12) = 2$
 $6 - 4x + 12 = 2$
 $-4x + 18 = 2$
 ~~-18~~ ~~-18~~
 $\frac{-4x}{-4} = \frac{-16}{-4}$
 $x = 4$

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

$(2x^2+x) - (4x-2) = x^2$
 $2x^2 + x - 4x + 2 = x^2$
 ~~$-x^2$~~ ~~$-x^2$~~
 $x^2 - 3x + 2 = 0$
 $(x-2)(x-1) = 0$
 $x = 2$ $x = 1$

24. $\frac{x-1}{x+6} = \frac{x-1}{2x-1}$

$2x^2 - 3x + 1 = x^2 + 5x - 6$
 ~~$-x^2 - 5x + 6$~~ ~~$-x^2 - 5x + 6$~~
 $x^2 - 8x + 7 = 0$
 $(x-7)(x-1) = 0$
 $x = 7$ $x = 1$