

No calculator. Show all work for full credit.

1. Simplify each rational expression, if possible.

a. $\frac{3x}{3x+6}$

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

$$= \boxed{\frac{x}{x+2}}$$

b. $\frac{16x^4}{12x^6}$

$$= \boxed{\frac{4}{3x^2}}$$

c. $\frac{x-3}{x^2-x-6}$

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

2. Perform the operation and simplify as much as possible.

a. $\frac{4x^3y}{xy^2} \cdot \frac{y^4}{10xy^2} = \frac{4x^3y^5}{10x^2y^4}$

$$= \boxed{\frac{2xy}{5}}$$

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

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

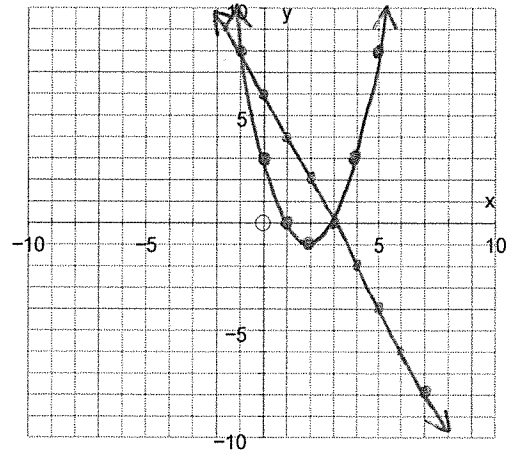
3. Solve the system of equations by graphing.

$$\begin{cases} y = -2x + 6 \\ y = x^2 - 4x + 3 \end{cases} = x^2 - 4x + 4 - 4 + 3$$

$$= (x-2)^2 - 1$$

vertex: (2, -1)

Solutions: $\boxed{(-1, 8) + (3, 0)}$

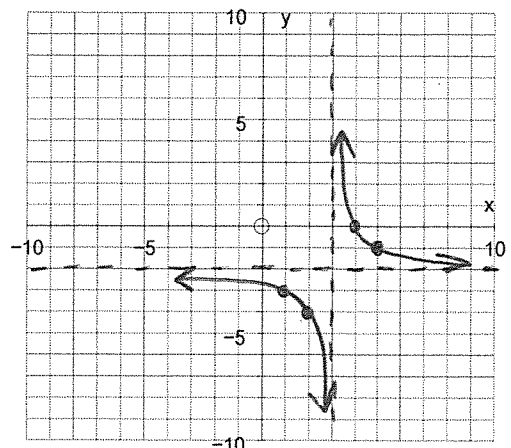


4. Graph $y = \frac{2}{x-3} - 2$.

x	y
1	-3
2	-4
4	0
5	-1

Vertical asymptote equation: $x = 3$

Horizontal asymptote equation: $y = -2$



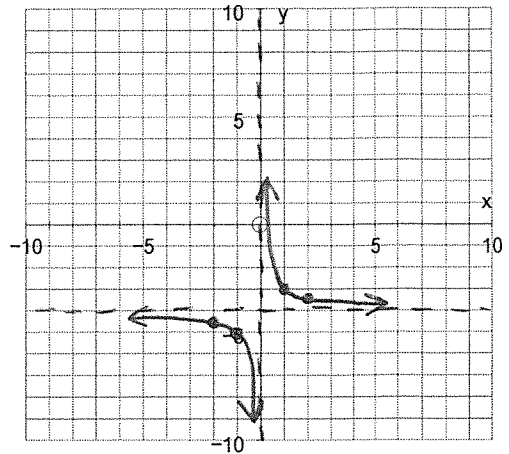
5. Graph $y = \frac{1-4x}{x}$. Re-write as two fractions.

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

x	y
-2	-4½
-1	-5
1	-3
2	-3½

Vertical asymptote equation: $x = 0$

Horizontal asymptote equation: $y = -4$



6. Give the domain and range of each relation. Then tell whether each is a function or not.

a. $\{(-2,5), (2,4), (-2,3)\}$

Domain: $\{-2, 2\}$
 Range: $\{5, 4, 3\}$
 Function? No

x	-2	-1	0	1
y	3	3	2	2

Domain: $\{-2, -1, 0, 1\}$
 Range: $\{3, 2\}$
 Function? Yes

7. Solve for x.

a. $\frac{5}{x+12} = \frac{2}{x}$

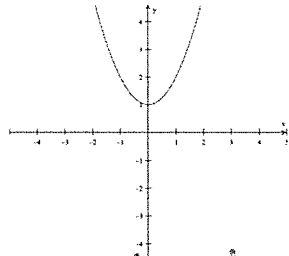
$$5x = 2(x+12)$$

$$5x = 2x + 24$$

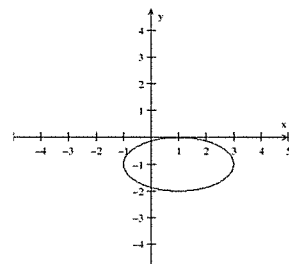
$$3x = 24$$

$$x = 8$$

b.

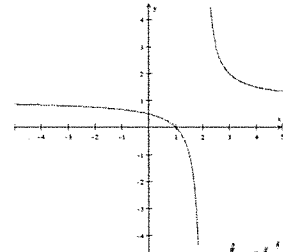


Domain: $(-\infty, \infty)$ or all real #
 Range: $[1, \infty)$ or $y \geq 1$
 Function? Yes



Domain: $[-1, 3]$ or $-1 \leq x \leq 3$
 Range: $[-2, 0]$ or $-2 \leq y \leq 0$
 Function? No

c.



Domain: all real #'s except 2.
 Range: all real #'s except 1.
 Function? Yes

or $x \neq 2$ or $(-\infty, 2) \cup (2, \infty)$
 or $y \neq 1$ or $(-\infty, 1) \cup (1, \infty)$

b. $\frac{7}{x+1} = \frac{3}{x} - \frac{4}{x+1}$

$$\frac{11}{x+1} = \frac{3}{x}$$

$$11x = 3(x+1)$$

$$11x = 3x + 3$$

$$x = \frac{3}{8}$$

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

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

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

$$2x^2 - 5x - 3 = 0$$

$$(2x+1)(x-3) = 0$$

$$x = -\frac{1}{2}, 3$$

8. Solve the equations by square rooting:

a) $\frac{1}{2}x^2 = 6$

$$x^2 = 12$$

$$x = \pm\sqrt{12}$$

$$x = \pm 2\sqrt{3}$$

b) $4x^2 = 49$

$$x^2 = \frac{49}{4}$$

$$x = \pm\sqrt{\frac{49}{4}}$$

$$x = \pm\frac{7}{2}$$

c) $4x^2 + 3 = 18$

$$4x^2 = 15$$

$$x^2 = \frac{15}{4}$$

$$x = \pm\sqrt{\frac{15}{4}}$$

$$x = \pm\frac{\sqrt{15}}{2}$$

d) $(x+2)^2 = 9$

$$x+2 = \pm 3$$

$$x = \pm 3 - 2$$

$$x = 1, -5$$

9. Simplify.

a) $3\sqrt{5} - \sqrt{5}$

$$2\sqrt{5}$$

b) $2\sqrt{20} + \sqrt{45}$

$$2(2\sqrt{5}) + 3\sqrt{5}$$

$$4\sqrt{5} + 3\sqrt{5}$$

$$7\sqrt{5}$$

c) $2\sqrt{6t} - 3\sqrt{5t} + 2\sqrt{6t}$

$$4\sqrt{6t} - 3\sqrt{5t}$$

d) $5\sqrt{12x} - \sqrt{3x}$

$$5(2\sqrt{3x}) - \sqrt{3x}$$

$$10\sqrt{3x} - \sqrt{3x}$$

$$9\sqrt{3x}$$

10. A baseball is hit, and its height is described by the equation $y = -16t^2 - 4t + 21$. Joe jumps to catch it, and his baseball glove is rising up fast! Its height follows the equation $y = 4t + 6$. At what height will Joe catch the ball?



when do they cross? ... solve the system.

$$-16t^2 - 4t + 21 = 4t + 6$$

$$-16t^2 - 8t + 15 = 0$$

$$(-4t + 3)(4t + 5) = 0$$

$$-4t + 3 = 0 \quad 4t + 5 = 0$$

$$\rightarrow t = \frac{3}{4} \quad t = -\frac{5}{4}$$

$$y = 4\left(\frac{3}{4}\right) + 6$$

$$y = 9 \text{ feet}$$

must be positive # of seconds

11. Circle the irrational numbers.

5.14

$\sqrt{6}$

8.16

$\frac{14}{15}$

π

$\sqrt{20}$

$-\frac{1}{6}$

-610

1.121221222...

$\sqrt[3]{7}$

8

$\overline{3.2671}$

3.1414141....