

HOMEWORK 8-1

1) a)

x	1	3	12	15
y	6	2	0.5	0.4

direct $y = k \cdot x$ or $k = \frac{y}{x}$
 inverse $y = \frac{k}{x}$ or $k = yx$

$1 \cdot 6 = 6$ $3 \cdot 2 = 6$ $12 \cdot 0.5 = 6$ $15 \cdot 0.4 = 6$

$k = 6$ INVERSE VARIATION

b)

x	-3	5	6	16
y	-15	25	30	80

$\frac{-15}{-3} = 5$ $\frac{25}{5} = 5$ $\frac{30}{6} = 5$ $\frac{80}{16} = 5$

$k = 5$ DIRECT VARIATION

2)
$$p = \frac{k \cdot q \cdot r \cdot t}{s}$$

p varies jointly with the product of q, r and t, and INVERSELY with s.

3) INVERSELY

a) $x = -13$ $y = 100$

find y when $x = 10$

$y = \frac{k}{x} \rightarrow k = yx$

$k = 100(-13)$

$k = -1300$

$y = \frac{-1300}{x} = \frac{-1300}{10}$

$y = -130$

b) $x = 20$ $y = -4$

$k = yx = -4 \cdot 20$

$k = -80$

$y = \frac{-80}{x} = \frac{-80}{10}$

$y = -8$

4) This table is on the back of the homework handout (by error)

# of muffins (m)	5	8	13	20
Sales (s)	12.50	20.00	32.50	50.00

both values increase

$$\frac{12.50}{5} = \frac{20}{8} = \frac{32.50}{13} = \frac{50}{20} = \boxed{2.5}$$

a) function

direct $y = k \cdot x$

$$k = \frac{y}{x}$$

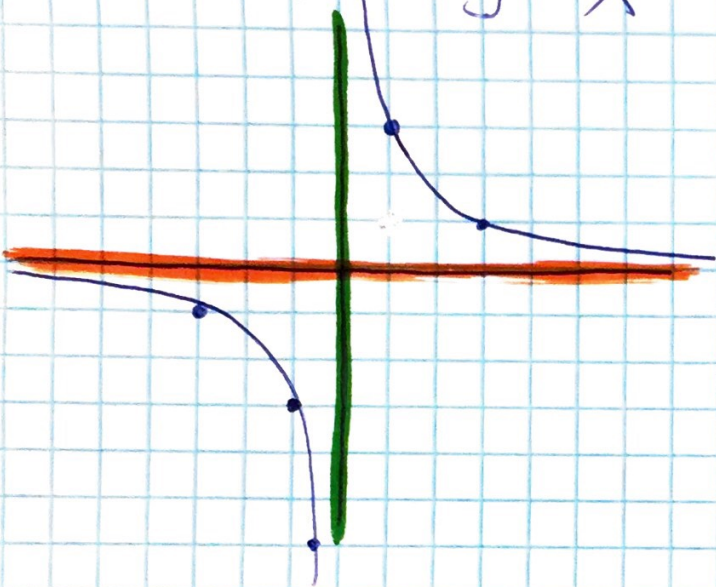
$$\boxed{y = 2.5x}$$

b) $\frac{250}{2.5} = \frac{2.5x}{2.5}$

$$\boxed{x = 100}$$

HOMWORK 8-2

1) Graph $y = \frac{3}{x}$



x	y
0	undef
1	3
$\frac{1}{2}$	6
-1	-3
$-\frac{1}{2}$	-6
undef	0

2) a) $y = \frac{1}{x} \longrightarrow y = \frac{1}{x} + 5$ [UP 5]

b) $y = \frac{1}{x} \longrightarrow y = -\frac{4}{x}$ [stretch by 4 reflection]

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

Transformation: LEFT 2, DOWN 7

DOMAIN: $x \neq -2$ or $(-\infty, -2) \cup (-2, \infty)$

RANGE: $y \neq -7$ or $(-\infty, -7) \cup (-7, \infty)$

asymptotes: $x = -2, y = -7$

$$1) \quad c) \quad \frac{x^2 - x - 2}{3x^2 - 7x + 2}$$

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

Factoring

$$3x^2 - 7x + 2$$

$$3x^2 - 6x - 1x + 2$$

$$3x(x-2) - 1(x-2)$$

$$(3x-1)(x-2)$$

6
-6 -1

points of discontinuity: $x = \frac{1}{3}$ $x = 2$

non-removable
(asymptote)

removable
(hole)

$$D: (-\infty, \frac{1}{3}) \cup (\frac{1}{3}, 2) \cup (2, \infty)$$

$$2) \quad a) \quad y = \frac{x-3}{x+5}$$

$$N_d = D_d$$

N_d - numerator degree
 D_d - denominator degree

$$y = \text{ratio of leading coefficients} = \frac{1}{1} = \boxed{1}$$

$$b) \quad y = \frac{x-3}{x^2+5x+6}$$

$$N_d < D_d$$

$$\boxed{y=0}$$

$$c) \quad y = \frac{x^2-1}{2x+2}$$

$$N_d > D_d$$

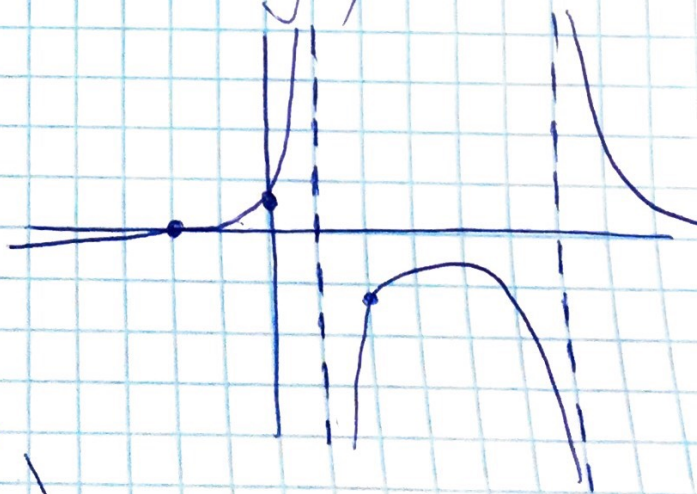
no horizontal asymptote

$$3) \quad y = \frac{x+3}{x^2-7x+6} = \frac{x+3}{(x-6)(x-1)}$$

asymptotes: $x=6$, $x=1$

h. asymptote $y=0$

a graph can cross a horizontal asymptote in the middle



HOMEWORK 8-4

1) a) $\frac{4x-12}{8x+24} = \frac{\cancel{4}(x-3)}{\cancel{8} \cdot 2(x+3)} = \boxed{\frac{x-3}{2(x+3)}} \quad x \neq -3$

b) $\frac{5x^2y}{15xy^2} = \frac{\cancel{5} \cdot \cancel{x} \cdot \cancel{x} \cdot y}{\cancel{15} \cdot 3 \cdot \cancel{x} \cdot y \cdot y} = \boxed{\frac{x}{3y}} \quad \begin{matrix} x \neq 0 \\ y \neq 0 \end{matrix}$

c) $\frac{x^2+8x+16}{x^2-2x-24} = \frac{(x+4)(\cancel{x+4})}{(x-6)(\cancel{x+4})} \quad x \neq 6, -4$
 $= \boxed{\frac{x+4}{x-6}}$

2) a) $\frac{x^2+3x-10}{x^2+4x-12} \cdot \frac{3x+18}{x+3} \quad x \neq -6, 2, -3$
 $\frac{(\cancel{x+5})(\cancel{x-2})}{(\cancel{x+6})(\cancel{x-2})} \cdot \frac{3(\cancel{x+6})}{x+3} = \boxed{\frac{3(x+5)}{x+3}}$

b) $\frac{x^2-7x+10}{x^2-8x+15} \div \frac{4-x^2}{x^2+3x-18} \quad \begin{matrix} 4-x^2 = -x^2+4 \\ = -(x^2-4) \\ = -(x-2)(x+2) \end{matrix}$
 $\frac{(\cancel{x-5})(x-2)}{(\cancel{x-5})(x-3)} \div \frac{-(x-2)(x+2)}{(x+6)(x-3)} \quad x \neq 5, 3, 2, -2, -6$
 $\frac{(\cancel{x-2})}{(\cancel{x-3})} \cdot \frac{(x+6)(\cancel{x-3})}{-(\cancel{x-2})(x+2)} = \boxed{-\frac{(x+6)}{x+2}}$

8-4 cont.

3) $y = \frac{x+1}{x^2+1}$ is it in simplest form?

Yes, the equation is in simplest form because x^2+1 cannot be factored (any number squared is positive or zero, plus 1, always equals a positive number, thus never equals to zero, which means it's not factorable). Since x^2+1 cannot be factored, this means it does not have a common factor with $x+1$.

4) A student claims that the only solution of the equation $\frac{x}{x-2} = \frac{2}{x-2}$ is $x=2$.

The student is wrong because $x=2$ is also a restricted value (it causes the expressions to be undefined).

5) Write a rational expression that simplifies to $\frac{x}{x+1}$ (multiply both numerator and denominator by the same factor)

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

HOMWORK 8-5

$$1) a) \frac{x+11}{3x-5} + \frac{x-21}{3x-5} = \boxed{\frac{2x-10}{3x-5}} \quad x \neq \frac{5}{3}$$

add numerators, denominators are already same

$$b) \frac{1}{x^2-4} + \frac{6}{x+2} = \frac{1}{(x-2)(x+2)} + \frac{6(x-2)}{(x+2)(x-2)}$$
$$= \frac{1+6x-12}{(x-2)(x+2)} = \boxed{\frac{6x-11}{(x-2)(x+2)}} \quad x \neq 2, -2$$

$$c) \frac{b-4}{b^2+2b-8} - \frac{b+2}{b^2-16} = \frac{b-4}{(b+4)(b-2)} - \frac{b+2}{(b-4)(b+4)}$$

$b \neq -4, 2, 4$

$$\frac{(b-4)(b-4) - (b+2)(b-2)}{(b+4)(b-4)(b-2)} = \frac{b^2-8b+16 - (b^2-4)}{(b+4)(b-4)(b-2)}$$

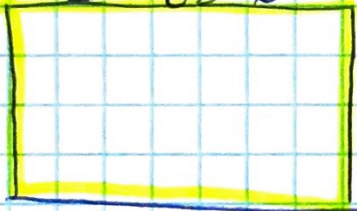
$$= \frac{\cancel{b^2}-8b+16 - \cancel{b^2}+4}{(b+4)(b-4)(b-2)} = \boxed{\frac{-8b+20}{(b+4)(b-4)(b-2)}}$$

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

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

$$2) \ a) \ \frac{\frac{2}{x} \cdot K}{\frac{3}{y} \cdot F} = \frac{2}{x} \cdot \frac{y}{3} = \boxed{\frac{2y}{3x}}$$

$$b) \ \frac{1 + \frac{2}{x}}{4 - \frac{6}{x}} = \frac{\frac{x+2}{x} \cdot K}{\frac{4x-6}{x} \cdot F} = \frac{x+2}{x} \cdot \frac{x}{4x-6} = \boxed{\frac{x+2}{4x-6}}$$

$$3) \ L = \frac{10b}{6b-6}$$


$$W = \frac{b+2}{2b-2}$$

$$\text{Perimeter} = 2 \cdot L + 2 \cdot W$$

$$= 2 \cdot \frac{10b}{6b-6} + 2 \cdot \frac{b+2}{2b-2}$$

$$= \frac{2 \cdot 10b}{6(b-1)} + \frac{2(b+2)}{2(b-1)}$$

$$= \frac{10b}{3(b-1)} + \frac{(b+2) \cdot 3}{(b-1) \cdot 3}$$

$$= \frac{10b + (b+2) \cdot 3}{3(b-1)} = \boxed{\frac{13b+6}{3(b-1)}}$$

HOMEWORK 8-6

1) a) $\frac{4}{x-2} = \frac{x-1}{x-2}$ $x \neq 2$ $\begin{matrix} 4 = x-1 \\ +1 \quad \quad +1 \end{matrix}$
 denominators are equal $\boxed{5 = x}$

b) $\frac{2a+1}{6} + \frac{a-3}{2 \cdot 3} = \frac{(a-1) \cdot 2}{3 \cdot 2}$

$\frac{2a+1}{\cancel{+1}} + 3a = \frac{2a-2}{\cancel{-1}}$

$\frac{3a}{3} = -\frac{3}{3}$ $\boxed{a = -1}$

c) $\frac{1 \cdot 2}{x \cdot 2} + \frac{x \cdot x}{2 \cdot x} = \frac{x+4}{2x}$

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

$x \neq 0$

$\begin{matrix} x^2 + 2 = x + 4 \\ -x - 4 \quad -x - 4 \end{matrix}$

$x^2 - x - 2 = 0$

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

$\boxed{x = 2, x = -1}$

2) 4 miles (equal distance)

$v = \frac{d}{t}$ $d = v \cdot t$

wind makes the speed slower (if wind to chest)

$10 = \frac{4}{t}$

$(10 - x) \cdot 1 = 10 \cdot \frac{2}{5}$

$t = \frac{4}{10} = \frac{2}{5}$ of an hour
 or 24 min

$10 - x = 4$

$\boxed{x = 6}$ $\frac{\text{miles}}{\text{hr}}$

4. A student claims that $x = 2$ is the only solution of the equation $\frac{x}{x-2} = \frac{2}{x-2}$. Is the student correct? Explain.

5. Write a rational expression that simplifies to $\frac{x}{x+1}$.

Practice 8-5: Complete your assignment on a separate sheet of paper. Show all work.

1. Add or subtract. State any restrictions on the variable.

a. $\frac{x+11}{3x-5} + \frac{x-21}{3x-5}$

b. $\frac{1}{x^2-4} + \frac{6}{x+2}$

c. $\frac{b-4}{b^2+2b-8} - \frac{b+2}{b^2-16}$

d. $\frac{2x}{x^2-x-2} - \frac{4x}{x^2-3x+2}$

2. Simplify the complex fraction.

a. $\frac{\frac{2}{3}}{\frac{x}{y}}$

b. $\frac{1+\frac{2}{x}}{4-\frac{x}{6}}$

3. A rectangle has a length of $\frac{10b}{6b-6}$ and a width of $\frac{b+2}{2b-2}$. Write an expression to represent the perimeter of the rectangle ($P = 2L + 2W$).

Practice 8-6: Complete your assignment on a separate sheet of paper. Show all work.

this table is for 8-1 question 4

# of muffins (m)	5	8	13	20
Sales (s)	\$12.50	\$20.00	\$32.50	\$50.00

1. Solve each equation. Check each solution.

a. $\frac{4}{x-2} = \frac{x-1}{x-2}$

b. $\frac{2a+1}{6} + \frac{a}{2} = \frac{a-1}{3}$

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

2. You are riding your bike to a store 4 mi away. When there is no wind, you ride at 10 mi/h. Today your trip took 1 hour. What was the speed of the wind today?