Homework Problems

Find the inverse of each:

① $y = \frac{1}{2} + \frac{x}{5}$

② $y = \frac{3x}{5} - \frac{1}{2}$

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

Homework Problems

Find the inverse of each:

① $y = \frac{1}{2} + \frac{x}{5}$ $\frac{10x - 5}{2} = y$

② $y = \frac{3x}{5} - \frac{1}{2}$ $\frac{10x + 5}{6} = y$

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

$-4x + 2 = y$

① $y = \frac{2x+1}{5} + 8$

$x = \frac{2y+1}{5} + \frac{8}{1}$

$x = \frac{2y+1+40}{5}$

$5x = 2y + 41$

$5x - 41 = 2y$

$\frac{5x-41}{2} = y$

$y = \frac{5x-41}{2}$

① $y = \frac{1}{2} + \frac{x}{5}$

$y = \frac{5+2x}{10}$

$x = \frac{5+2y}{10}$

* switch x & y.

$x = \frac{1}{2} + \frac{y}{5}$

$\cancel{\frac{x}{1} = \left(\frac{5+2y}{10}\right)}$

$10x = 1(5+2y)$

$10x = 5 + 2y$

$-5 \quad -5$

$\frac{10x-5}{2} = \frac{2y}{2}$

$\frac{10x-5}{2} = y$

$\frac{10x}{2} - \frac{5}{2} = y$

$5x - 5/2 = y$

$5x - 5/2 = y$

② $y = \frac{3x}{5} - \frac{1}{2}$

$x = \frac{3y}{5} - \frac{1}{2}$

$\frac{x}{1} = \frac{6y - 5}{10}$

$10x = 6y - 5$

$10x + 5 = 6y$

$\frac{10x + 5}{6} = y$

$\frac{5(x + 1/2)}{3} = y$

$\frac{5x + 5/2}{3} = y$

$\frac{2}{2} \cdot \frac{(5x + 5/2)}{3} = y$

$\frac{10x + 5}{6} = y$

$(10)x = \frac{6y - 5}{10}(10)$

$10x = 6y - 5$

② $2y = \frac{3x}{5} - \frac{2}{7}$

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

$\frac{2x}{1} = \frac{(21y - 10)}{35}$

$35(2x) = 21y - 10$

$70x = 21y - 10$

$70x + 10 = 21y$

$\frac{70x + 10}{21} = y$

Could:

$\frac{10(7x+1)}{21} = y$

② $y = \frac{3x}{5} - \frac{1}{2}$

$x = \frac{3y}{5} - \frac{1}{2}$

$\frac{x}{1} = \frac{6y - 5}{10}$

$10x = 6y - 5$

$10x + 5 = 6y$

$\frac{10x + 5}{6} = y$

② $y = \frac{3x}{5} - \frac{1}{2}$

$x + \frac{1}{2} = \frac{3y}{5}$

$\frac{5(x + \frac{1}{2})}{3} = \frac{3y}{3}$

$\frac{5(x + \frac{1}{2})}{3} = y$

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

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

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

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

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

$\cancel{\frac{x}{1} = \frac{-y+2}{4}}$

$(4)x = \frac{-y+2}{\cancel{4}}\cancel{(4)}$

$4x = -y + 2$

$4x = -y + 2$

$4x - 2 = -y$

$-4x + 2 = y$

$4(x) = \cancel{4}^{2}\left(\frac{y+1}{\cancel{2}}\right) - \cancel{4}\left(\frac{3y}{\cancel{4}}\right)$

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

③ $\frac{y+1}{2} = \frac{x}{3} + \frac{7}{2}$

$\frac{x+1}{2} = \frac{y}{3} + \frac{7}{2}$

$\frac{(x+1)}{2} = \frac{(2y+21)}{6}$

$6x+6 = 4y + 42$

$-42 \qquad -42$

$\frac{6x-36}{4} = \frac{4y}{4}$

$\frac{6x-36}{4} = y$

$\frac{3x-18}{2} = y \iff \frac{3(x-6)}{2} = y$

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

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

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

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

$4x = -y+2$ (4)

$4x - 2 = -y$

$-4x + 2 = y$

Inverse of a Function

To Find:
1. Switch the x and y
2. Solve for y
3. Is the inverse a function

Skills Needed:
1. Multiplication
2. Division
3. Solving for a variable

Remember from last week:
1. Common Dominator
2. Combining Like Terms
3. GCF

Basic

$$y = 3x + 2$$

$$x = 3y + 2$$
$$-2 \qquad -2$$

$$\frac{x-2}{3} = \frac{3y}{3}$$

$$\frac{x-2}{3} = y$$

Find the inverse

Steps

1) switch x and y
2) solve for y.
   * move the constants coefficients

More practice

$$y = \frac{(x+1)}{3} - \frac{4}{5}$$

$$x = \frac{(y+1)}{3} - \frac{4}{5}$$ switch x & y

$$x = \frac{5y+5-12}{15}$$ common denominator

$$\cancel{\frac{x}{1} = \frac{5y-7}{15}}$$

$$(15)x = \frac{5y-7}{\cancel{15}}(\cancel{15})$$

$$x(15) = 5y-7$$

$$15x = 5y-7$$

$$+7 \qquad +7$$

$$\frac{15x+7}{5} = \frac{\cancel{5y}}{\cancel{5}}$$

$$\frac{15x+7}{5} = y$$

$$15x = 5y-7$$

$$\frac{15x}{5} + \frac{7}{5} = y$$

$$3x + 7/5 = y$$

Short cut

$$8\left[\frac{3}{4} = \frac{x}{8} - \frac{7}{2}\right]$$

$$2(3) = x - 4(7)$$

$$40\left[\frac{3}{5} = \frac{x}{8} - \frac{7}{2}\right]$$

$$\cancel{40}^{8}\left(\frac{3}{\cancel{5}}\right) = \cancel{40}^{5}\left(\frac{x}{\cancel{8}}\right) - \cancel{40}^{20}\left(\frac{7}{\cancel{2}}\right)$$

$$24 = 5x - 140$$

What if...

$$56\left[\frac{3}{8} = \frac{x}{7} - \frac{1}{2}\right]$$

$$56\left(\frac{3}{8}\right) = 56\left(\frac{x}{7}\right) - 56\left(\frac{1}{2}\right)$$

$$\cancel{56}^{7}\left(\frac{3}{\cancel{8}}\right) = \cancel{56}^{8}\left(\frac{x}{\cancel{7}}\right) - \cancel{56}\left(\frac{1}{\cancel{2}}\right)$$

$$21 = 8x - 28(1)$$

$$21 = 8x - 28$$

common denominator

$$40\left[\frac{x}{8} = \frac{y}{5} + \frac{3y+2}{4}\right]$$

$$\cancel{40}^{5}\left(\frac{x}{\cancel{8}}\right) = \cancel{40}^{8}\left(\frac{y}{\cancel{5}}\right) + \cancel{40}^{10}\left(\frac{3y+2}{\cancel{4}}\right)$$

$$5x = 8y + 10(3y+2)$$

$$5x = 8y + 30y + 20$$

$$5x = 38y + 20$$

$$5x - 20 = 38y$$

$$\frac{5x-20}{38} = y$$

Find the inverse

$$\frac{y}{5} = \frac{x}{6} - \frac{3x}{15}$$

$$\cancel{30}\left(\frac{y}{\cancel{5}}\right) = \cancel{30}\left(\frac{x}{\cancel{6}}\right) - \overset{2}{\cancel{30}}\left(\frac{3x}{\cancel{15}}\right)$$

$$6y = 5x - 6x$$

$$6x = 5y - 6y$$

$$6x = -y$$

$$-6x = y$$

• switch x and y

Inverse

Find the inverse

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

You will use

1. switch x & y
2. cross multiplication
3. distribute
4. move "y"
5. GCF
6. solve steps

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

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

$$xy - x = 2y - 3$$

$$-2y \qquad -2y$$

$$xy - 2y - x = -3$$

$$+x \qquad +x$$

$$xy - 2y = x - 3$$

GCF

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

$$\boxed{y = \frac{x-3}{x-2}}$$ the inverse

$$y = \frac{2x+3}{x+2}$$

① switch x & y

$$x = \frac{2y+3}{y+2}$$

② cross multiply or multiply by $(y+2)$

$$\frac{x}{1} = \frac{2y+3}{y+2}$$

$$(y+2)x = (2y+3)$$

$$x(y+2) = 2y+3$$

③ Think ... distribute

$$x(y+2) = 2y+3$$

$$\boxed{xy} + 2x = 2y + 3$$

Step 1

④ "x" one side = "y" one side

$$2x = 2y - xy + 3$$
$$-3 \qquad\qquad -3$$

$$2x - 3 = 2y - xy$$

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

Now FACTOR the GCF

$$\boxed{\frac{2x-3}{2-x} = y}$$

Practice

$$\frac{3y}{2} = \frac{(5x-4)}{(x+1)}$$

$$3y(x+1) = 2(5x-4)$$

$$3x(y+1) = 2(5y-4)$$

$$3xy + 3x = 10y - 8$$

$$-3xy \qquad -3xy$$

$$3x = 10y - 3xy - 8$$

$$+8 \qquad +8$$

$$3x + 8 = 10y - 3xy$$

$$\frac{3x+8}{(10-3x)} = \frac{y\cancel{(10-3x)}}{\cancel{(10-3x)}}$$

$$\boxed{\frac{3x+8}{10-3x} = y}$$

* Distribute
* "y" together
* Factor out a "y"

Factor out the "y"

Find the inverse

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

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

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

Finish the rest for homework

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

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

switch x & y

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

cross multiply

$$3xy - 9x = 2y + 2$$

distribute

$$-2y \qquad -2y$$

$$3xy - 2y - 9x = 2$$

Group the "y" together on 1 side

$$+9x \qquad +9x$$

$$3xy - 2y = 2 + 9x$$

GCF the "y"

$$\frac{y(3x-2)}{(3x-2)} = \frac{2 + 9x}{(3x-2)}$$

solve for "y" ... use division

Answer $y = \frac{2+9x}{3x-2}$

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1) $f(x) = -\frac{4x}{x^2 - x}$ $= -\frac{4x}{0}$

$y = \frac{4x}{3x-2} + \frac{1}{5}$

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

$y =$

3) $f(x) = \frac{x-1}{2x^2 - 8}$

$y =$

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

$y =$

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

$$y = \frac{4/x}{3x-2} + \frac{1}{5}$$

$$x = \frac{4/y}{3y-2} + \frac{1}{5}$$

$$\frac{x}{1} = \frac{20y + 3y - 2}{15y - 10}$$ Simplify by combine the like terms

$$\frac{x}{1} = \frac{(23y-2)}{(15y-10)}$$ cross multiply

$$x(15y-10) = 23y-2$$ distribute

$$15xy - 10x = 23y - 2$$ now get the "y" on one side of =

$$15xy - 23y - 10x = -2$$

$$15xy - 23y = 10x - 2$$ GCF the "y"

$$y(15x - 23) = 10x - 2$$

Divide each side by (15x-23)

$$y = \frac{10x-2}{15x-23}$$

answer

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

$$y = \frac{4x}{3x-2} + \frac{1}{5}$$

$$x = \frac{4y}{3y-2} + \frac{1}{5}$$

$$\frac{x}{1} = \frac{20y + 3y - 2}{15y - 10}$$ simplify by combine the like terms

$$\frac{x}{1} = \frac{(23y-2)}{(15y-10)}$$ cross multiply

$$x(15y - 10) = 23y - 2$$ distribute

$$15xy - 10x = 23y - 2$$ now get the "y" on one side of =

$$15xy - 23y - 10x = -2$$

$$15xy - 23y = 10x - 2$$ GCF the "y"

$$y(15x - 23) = 10x - 2$$

Divide each side by (15x-23)

$$y = \frac{10x-2}{15x-23}$$

answer

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② $y = \frac{3x}{5} - \frac{1}{2}$ $\frac{10x + 5}{6} = y$

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

$-4x + 2 = y$

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

$4\left[x = \frac{y+1}{2} - \frac{3y}{4}\right]$

common denominator

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

$x = \frac{2y+2}{4} - \frac{3y}{4}$ common denominator

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

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

$4x = -y+2$

$4x-2 = -y$

$-4x+2 = y$

$$4\left[x = \frac{y+1}{2} - \frac{3y}{4}\right]$$

common denominator

$$4(x) = \overset{2}{\cancel{4}}\left(\frac{y+1}{\cancel{2}}\right) - \cancel{4}\left(\frac{3y}{\cancel{4}}\right)$$

$$4x = 2(y+1) - 1(3y)$$

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

$$30\left[\frac{y}{3} = \frac{x}{6} + \frac{5}{10}\right]$$

$$\cancel{30}^{10}\left(\frac{y}{\cancel{3}}\right) = \cancel{30}^{5}\left(\frac{x}{\cancel{6}}\right) + \cancel{30}^{3}\left(\frac{5}{\cancel{10}}\right)$$

$$10(y) = 5(x) + 3(5)$$

$$10y = 5x + 15$$

Practice

$$y = \frac{2x}{3} - \frac{4x}{5}$$

$$15\left[x = \frac{2y}{3} - \frac{4y}{5}\right]$$

$$15x = 10y - 12y$$

$$15x = -2y$$

$$\frac{15x}{-2} = y$$

$$y = \frac{-15x}{2}$$

$$x = \frac{10y - 12y}{15}$$

$$15x = -2y$$

$$\frac{15x}{-2} = y$$

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

switch x and y

✓ cross multiply

* distribute

✓ get "y" to one side

GCF the "y"

Alg. steps to solve

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

$$x(-y-2) = 2y+3$$

$$-xy - 2x = 2y + 3$$

$$+xy \qquad\qquad +xy$$

$$-2x = 2y + xy + 3$$

$$-3 \qquad\qquad -3$$

$$-2x - 3 = 2y + xy$$

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

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

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

① $y = \frac{1}{2} + \frac{x}{5}$

$x = \boxed{\frac{1}{2} + \frac{y}{5}}$

Steps

① switch x and y

② Solve for y

* common denominator
* cross multiply
* alg. steps

$\cancel{\frac{x}{1} = \frac{5+2y}{10}}$

$(10)x = \frac{5+2y}{\cancel{10}}\cancel{(10)}$

$10x = 5 + 2y$

$-5 \quad -5$

$\frac{10x-5}{2} = \frac{2y}{2}$

$\boxed{\frac{10x-5}{2} = y}$

① $y = \frac{1}{2} + \frac{x}{5}$

② $y = \frac{3x}{5} - \frac{1}{2}$

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