J is jointly proportional to G and V, and $J=\sqrt{3}$ when $G=\sqrt{5}$ and $V=\sqrt{7}$.

Find J when $G=\sqrt{15}$ and $V=7$.

2.6 #15
#38 from text
Keith

$J = 3\sqrt{7}$

(Simplify your answer. Type an integer or a fraction.)

$y = kx$ y is proportional to x

Joint Proportionality

$y = kxz$

Inverse Proportionality

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

$J = kGV$

Find constant of proportionality

$\sqrt{3} = k\sqrt{5}\sqrt{7}$

$\frac{\sqrt{3}}{\sqrt{35}} = k$

Square root of the quotient.

Find J:

$J = kGV$

$J = \frac{\sqrt{3}}{\sqrt{35}} \cdot \sqrt{15} \cdot 7 = \frac{7\sqrt{3}\sqrt{15}}{\sqrt{7 \cdot 5}}$

$= \frac{7\sqrt{3 \cdot 3 \cdot 5}}{\sqrt{7 \cdot 5}} = 7\sqrt{\frac{3 \cdot 3 \cdot \cancel{5}}{7 \cdot \cancel{5}}} = 7 \cdot \frac{3}{\sqrt{7}}$

$= \frac{7 \cdot 3}{\sqrt{7}} = \frac{7 \cdot 3\sqrt{7}}{\sqrt{7}\sqrt{7}} = \frac{\overset{3}{\cancel{21}}\sqrt{7}}{\cancel{7}} = \boxed{3\sqrt{7}}$

$\sqrt{7 \cdot 7} = 7$

Let $f = \{(-9,-8),(7,9),(9,-3)\}$ and $h = \{(-8,9),(7,-3)\}$.

Nate
2.4 #11
#33 in book

Find $(f \circ h)(x) = f(h(x))$

$f \circ h = \{\square\}$
(Type an ordered pair.)

Look for

Recall $\mathcal{D}(f \circ h) = \{x \mid x \in \mathcal{D}(h) \text{ And } h(x) \in \mathcal{D}(f)\}$

$= \{-8\}$

$f(h(-8)) = -3 \rightsquigarrow \{(-8,-3)\}$

Sep 21-7:35 AM

2.4 #16
#63 in book
Clint

Let $f(x) = |x|$, $g(x) = x - 7$, and $h(x) = x^3$.

Write $\boxed{F(x) = x^3 - 7}$ as a composition of functions.

Which of the following compositions correctly defines $F(x) = x^3 - 7$? $= (g \circ h)(x)$

cube it, subtract 7.

$h(x) = x^3$ $g(x) = x - 7$

$$F(x) = g(h(x)) = g(x^3) = x^3 - 7 = F(x)$$

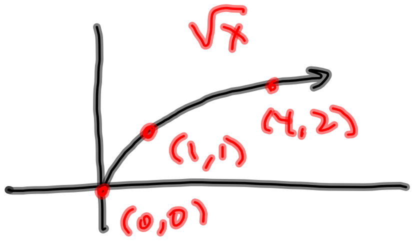
See functions inside other functions.

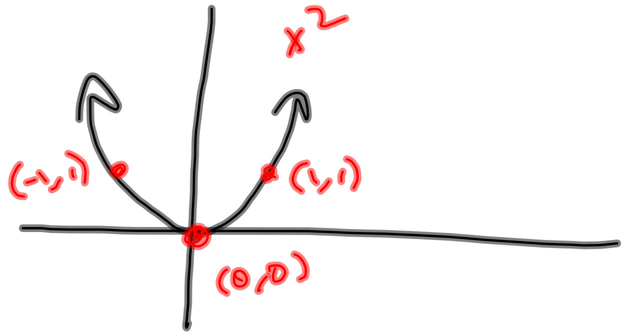
$f(x) = (2x-3)^3$ write as a composition of two simpler functions

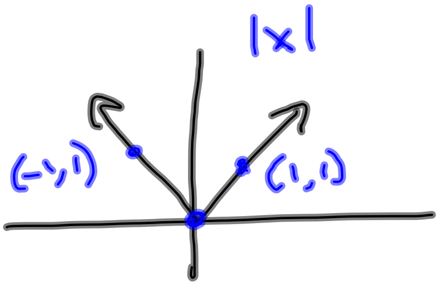
$g(x) = 2x-3$

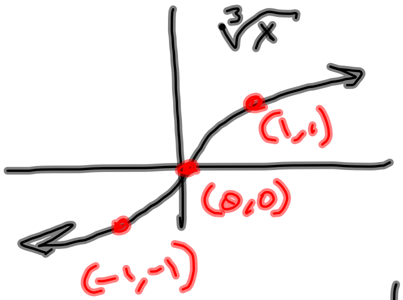
$h(x) = x^3$

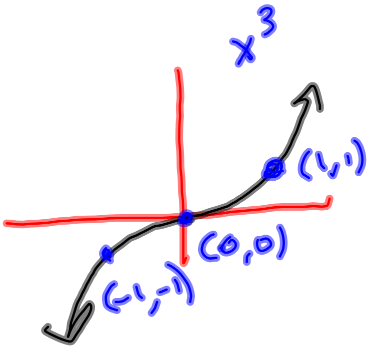
$h(g(x)) = h(2x-3) = (2x-3)^3$



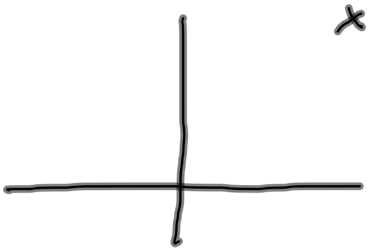








$\frac{1}{x}$ coming soon.



Let $f(x) = x - 5$.

2.4 #15
#57 in book

Find $(f \circ f)(x)$ and its domain.

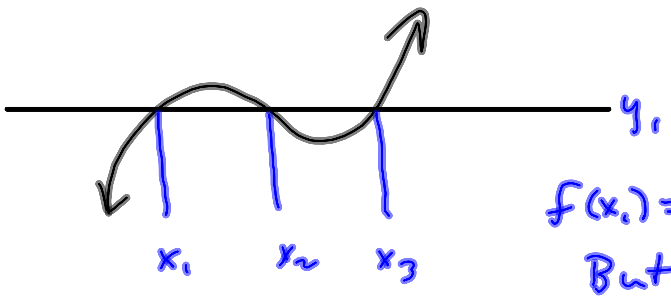
$(f \circ f)(x) = f(f(x)) = f(x-5) = (x-5)-5$

$= x-10$

Sep 21-7:38 AM

§2.5 Function: A relation in which each x in the domain corresponds with one y in the range. Vertical Line Test

1-to-1 Function: A function in which each y in the range corresponds with one x in the domain. Horizontal Line Test.



$f(x_1) = f(x_2) = y_1$

But $x_1 \neq x_2$

Not 1-to-1.

1-to-1 is important:

we want the INVERSE relation to be a function.

$F: \{(1,2), (3,5), (4,2)\}$ is a function. Not 1-to-1.

$F^{-1}: \{(2,1), (5,3), (2,4)\}$ is NOT a function b/c F isn't 1-to-1.

The inverse of f, or "f-inverse" is written f^{-1}, the inverse with respect to the operation of function composition.

Arithmetic:

Addition: 3 $\quad -3 \quad 3 + -3 = 0 =$ Identity

Multiplication: $3 \quad \frac{1}{3} \quad 3 \cdot \frac{1}{3} = 1 =$ Identity

Composition: $f(x) \quad f^{-1}(x) \quad f \circ f^{-1} = x =$ Identity

$f^{-1} \neq \frac{1}{f}$, although it kind of acts that way, if you view composition as multiplication, but DON'T.

Let $f(x) = 3x - 7$, $g(x) = \frac{1}{3}x + \frac{7}{3} = \frac{x+7}{3}$

Claim: $g(x) = f^{-1}(x)$

Proof: $(f \circ g)(x) = f(g(x)) = f\left(\frac{x+7}{3}\right)$

$= 3\left(\frac{x+7}{3}\right) - 7 = x + 7 - 7 = x$ Sweet. $\blacksquare$

$f(x)$ is 1-to-1:

If $x_1 \neq x_2$, then $f(x_1) \neq f(x_2)$

If $f(x_1) = f(x_2)$, then $x_1 = x_2$

we use this.

$f(x) = 3x - 7$ is 1-to-1

Proof: Suppose $f(x) = f(x_2)$.

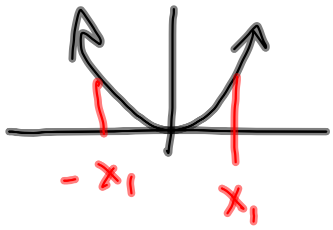
$$3x_1 - 7 = 3x_2 - 7$$

$$3x_1 = 3x_2$$

$$x_1 = x_2 \quad \blacksquare$$

$f(x) = x^2$ is not 1-to-1.

METHOD 1: Proof



$$f(x_1) = f(x_2)$$

$$x_1^2 = x_2^2$$

$$\sqrt{x_1^2} = \sqrt{x_2^2}$$

$$|x_1| = |x_2|$$

$x_1 = x_2$ OR $x_1 = -x_2$

Two possibilities

METHOD 2: Counterexample

Find two x-values $\ni$ f(x) is the same.

$x_1 = -1,\ x_2 = +1$

$$f(x_1) = (-1)^2 = 1 = 1^2 = f(x_2)$$

To find $f^{-1}(x)$, swap x & y, solve for y

$f(x) = 3x - 7$

$y = 3x - 7$

$x = 3y - 7$

$3y - 7 = x$

$3y = x + 7$

$y = \boxed{\frac{x+7}{3} = f^{-1}(x)}$

Find $f^{-1}(x)$

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

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

$$(2y-1)\,x = \frac{y+1}{\cancel{2y-1}} \cdot \cancel{(2y-1)}$$

$$2yx - x = y + 1$$
$$-y = -y$$

$$2yx - x - y = 1$$
$$+x = +x$$

$$2yx - y = x + 1$$

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

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

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

$$f(g(x)) = f\left(\frac{x+1}{2x-1}\right)$$

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

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

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

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

$$\frac{3x}{\cancel{2x-1}} \cdot \frac{\cancel{2x-1}}{3} = \frac{3x}{3} = x$$