Inverses Functions & Relations (card)

Def: 2 relations f & g are inverses iff both of their compositions are the identity function ($y=x$)

this means $f(g(x))=x$ & $g(f(x))=x$

- it does not mean they equal the same thing - they must equal x!!

Notation: $f^{-1}(x)$: inverse of $f(x)$

(not an exponent, f is the name of a function not a variable!!)

Use the definition of inverses to show that $f(x) = 6 - 2x$ &

$g(x) = \dfrac{6-x}{2}$ are inverses:

$$f(g(x)) = f\left(\frac{6-x}{2}\right) = 6 - \cancel{2}\left(\frac{6-x}{\cancel{2}}\right) = 6 - 6 + x$$

$$= x$$

$$g(f(x)) = g(6-2x) = \frac{6-(6-2x)}{2} = \frac{0+2x}{2} = x$$

Inverses - graphically (card)

Inverse relations are reflections of each other over the line y = x (identity function)

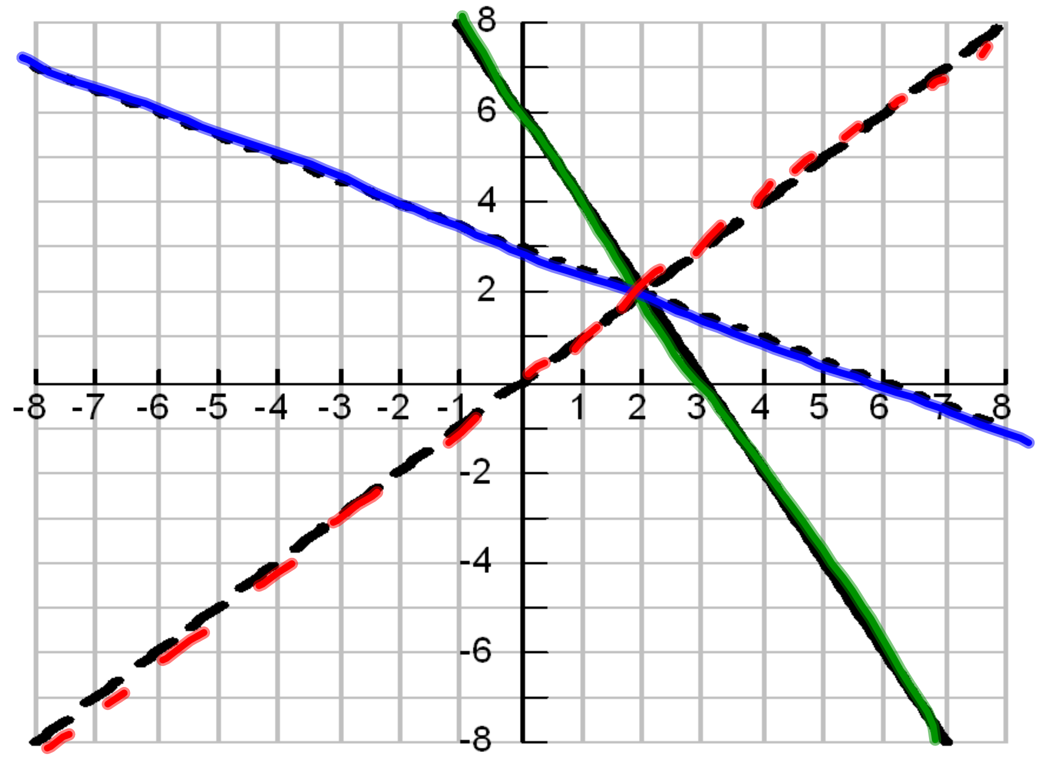
mirror images over y = x

so if g(x) and f(x) are inverses then every point (a,b) if f(x) will be reflected onto its mirror image (b,a) in g(x) and vise versa

Property of inverse relations: Suppose f & f^{-1} are inverse relations, then $f(a)=b$ iff $f^{-1}(b)=a$

back

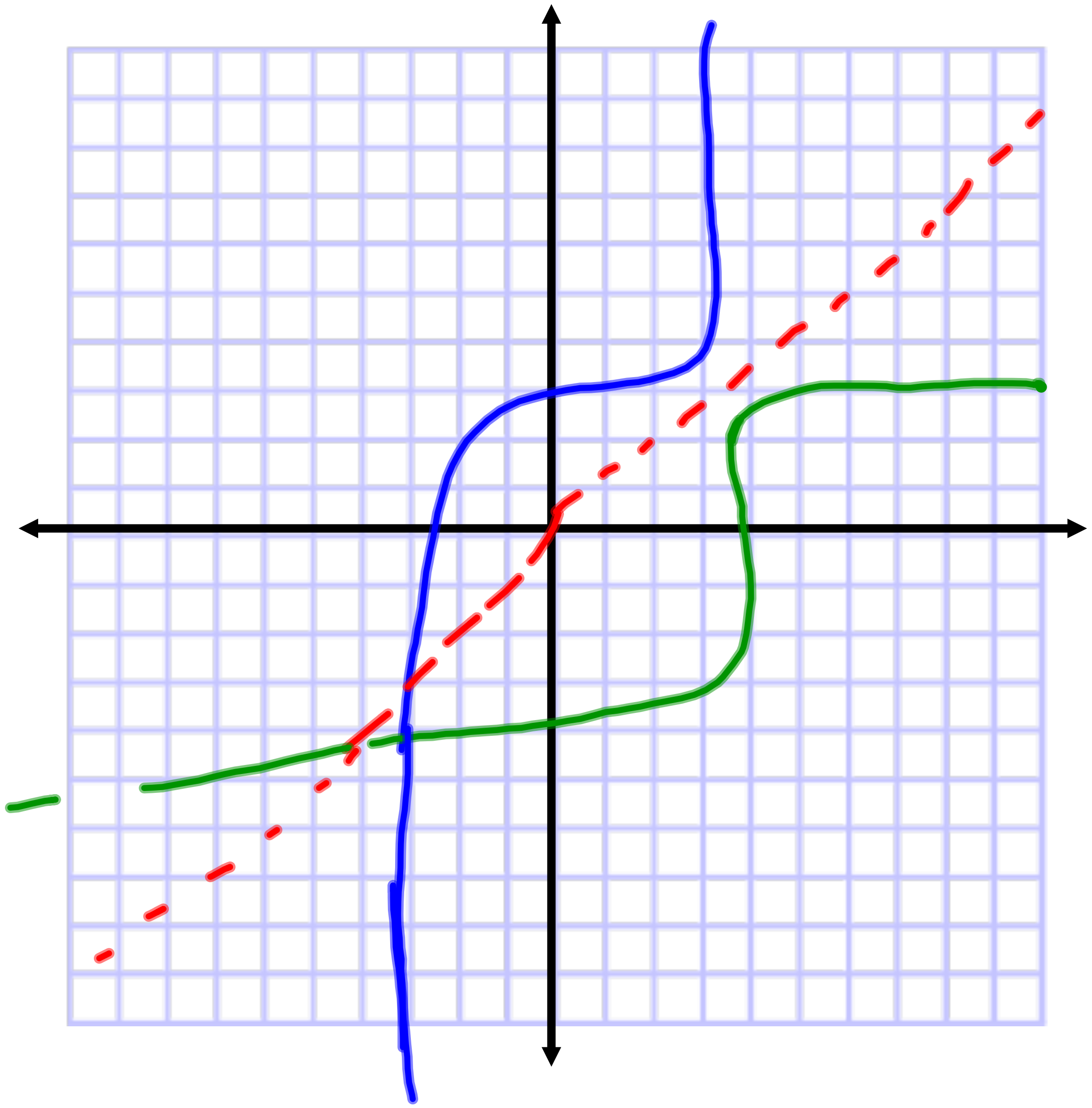
Graph to show $f(x) = 6 - 2x$ and $g(x) = \dfrac{6-x}{2}$ are inverses



Fold at y =x , graphs will lie on top of each other if they are inverses or Look at pts:

f	(1,4)	(3,0)	(4,-2)
g	(4,1)	(0,3)	(-2,4)

Finding inverses graphically



1. Draw in y = x
2. reflect f over y = x

Finding an Inverse Algebraically (card)

Steps:

1. replace f(x) or relation name w/ y if not in that form

2. switch the x & y in the eq. (just x & y not signs, coefficients, or exponents)

3. Solve for y.

4. replace y with relation name^{-1} (f^{-1} or g^{-1})

back

find the inverse

$$f(x) = x^2 + 1$$

$$y = x^2 + 1$$

$$x = y^2 + 1$$

$$-1 \qquad -1$$

$$\sqrt{x-1} = \sqrt{y^2}$$

$$\pm\sqrt{x-1} = y$$

$$f^{-1}(x) = \pm\sqrt{x-1}$$

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

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

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

$$2yx + 3x = y + 1$$

$$-y \qquad -y$$

$$2yx - y + 3x = 1$$

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

$$2yx - y = 1 - 3x$$

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

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

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

Is the inverse a function????
How can I tell?

One-to-One (card) 17

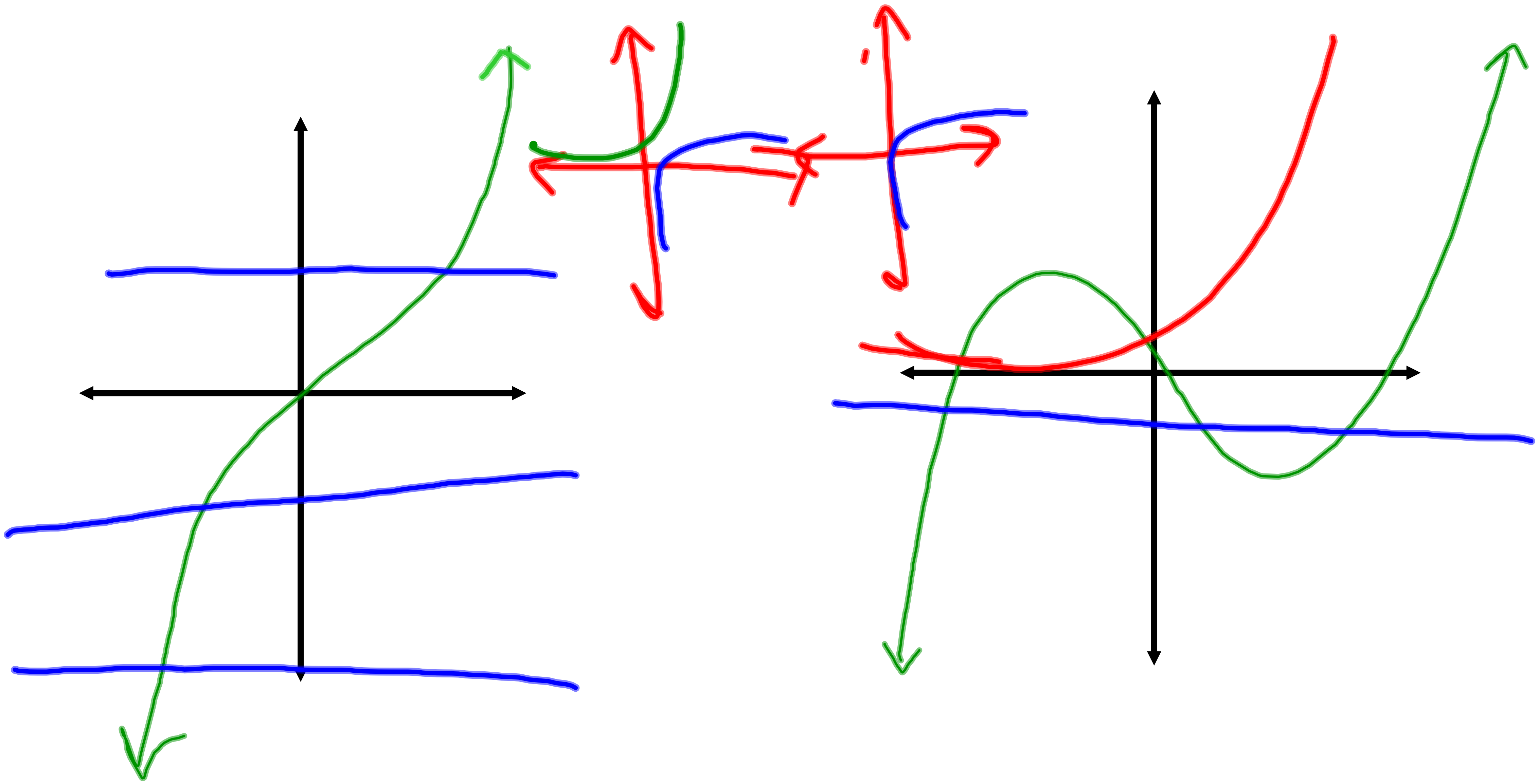
- a function whose inverse is also a function

a function such that each x is paired with only one y and each y is paired with only one x

must pass the horizontal line test to be one to one

(back of one to one card)

Determine if each function is one to one



$$f(x)=\sqrt{2x-3}$$

$2x-3\geq 0$ $x\geq 3/2$
$2x\geq 3$

Find the inverse and the domain of f^{-1} including any inherited restrictions

D: $[3/2,\infty)$ R: $[0,\infty)$

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

$x\geq 3/2$ $y\geq 0$

$x\geq 0$ $y\geq 3/2$

$x^2=\sqrt{2y-3}^2$

$x^2=2y-3$
$+3 \quad +3$

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

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

$f^{-1}(x)=\frac{x^2+3}{2}$ D: $[0,\infty)$ R: $[3/2,\infty)$