Nov. 12, 2012

Sect. 5-2 & 1

- Combination Fncts.
- Composite Fncts.
  - Domain
- Inverse Fncts.

Combination Fncts
(A/S/M/D)

$f(x) = x^2 - 3$

$g(x) = 2x^2 - 7x + 1$

$(f+g)(x) = f(x) + g(x)$

$= [x^2 - 3] + [2x^2 - 7x + 1]$

$= 3x^2 - 7x - 2$

$(f-g)(x) = -x^2 + 7x - 4$

$$(fg)(x) = (x^2-3)(2x^2-7x+1)$$

$$= 2x^4 - 7x^3 + x^2 - 6x^2 + 21x - 3$$

$$= 2x^4 - 7x^3 - 5x^2 + 21x - 3$$

$$\left(\frac{f}{g}\right)(x) = \frac{x^2-3}{2x^2-7x+1}$$

$$f(x) = x^2 + 5x + 6$$

$$g(x) = x + 3$$

Get Dom. Here

$$\left(\frac{f}{g}\right)(x) = \frac{x^2+5x+6}{x+3} = \frac{\cancel{(x+3)}(x+2)}{\cancel{x+3}}$$

$$= x + 2$$

Domain: $\{x \mid x \neq -3\}$

Composite Fncts

Putting one fnct. inside another

Notation: $(f \circ g)(x) = f(g(x))$

$(g \circ f)(x) = g(f(x))$

Note: $(f \circ g)(x) \neq (g \circ f)(x)$
necessarily

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

$$g(x) = x^2 + 2$$

$$(f \circ g)(x) = f(g(x))$$

$$= 3(x^2 + 2) + 1$$

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

$$= 3x^2 + 7$$

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

$$g(x) = x^2 + 2$$

$$(g \circ f)(x) = g(f(x))$$

$$= (3x+1)^2 + 2$$

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

$$= 9x^2 + 3x + 3x + 1 + 2$$

$$= 9x^2 + 6x + 3$$

Domain

1. Find the bad #s for the inside fnct. Throw them away.
2. Find bad #s for outside fnct. DO <u>NOT</u> throw them away.
3. Set inside fnct. = step 2 answers. Solve these eqns.
4. Throw step 3 answers away.
5. Domain of composite is what's left over.

$$f(x) = \frac{5}{x+2} \qquad g(x) = x - 3$$

Find Domain of $(f \circ g)(x) = f(g(x))$

1. No bad #s.
2. $x = -2$
3. $x - 3 = -2$

   $x = 1$
4. $x \neq 1$
5. $\{x \mid x \neq 1\}$

Find Domain of $(g \circ f)(x) = g(f(x))$

1. $x \neq -2$

2. No bad #s.

3. }
4. } Nothing to do.

5. $\{x \mid x \neq -2\}$

Inverse Fncts

"Opposite" Fncts

f & g are inverses.

$$f(a) = b$$

$$g(b) = a$$

f & g are inverses

$$f(g(x)) = x$$

$$g(f(x)) = x$$

This is a test for inverse

Is $f(g(x)) = x = g(f(x))$

$f(x) = 2x - 1$

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

Are f & g inverses?

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

$$= x + 1 - 1$$

$$= x$$

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

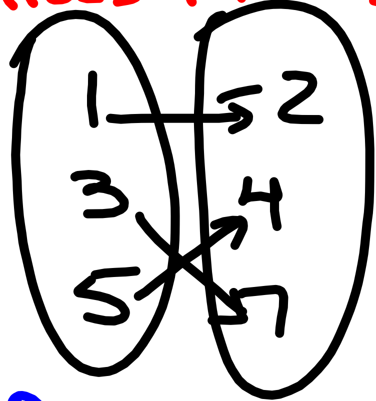
$$= \frac{2x}{2}$$

$$= x$$

Yes f & g are inverses.

Not every fnct has an inverse.

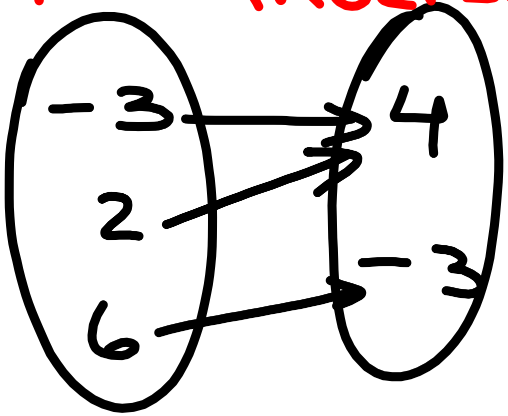
Has inverse



One-to-One

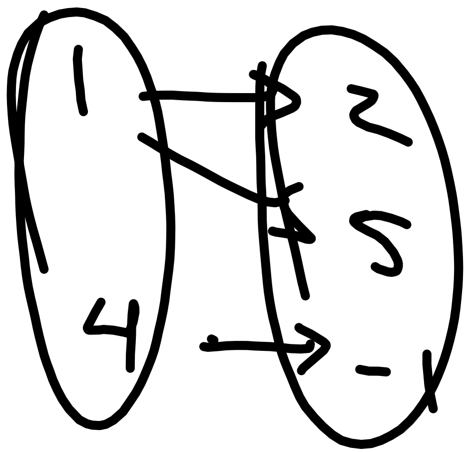
1-1

No inverse

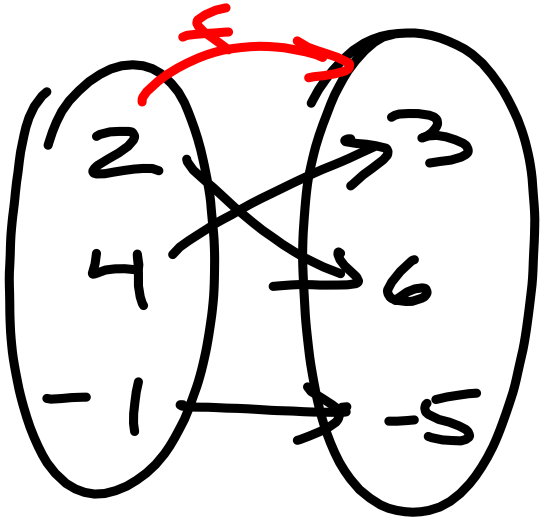


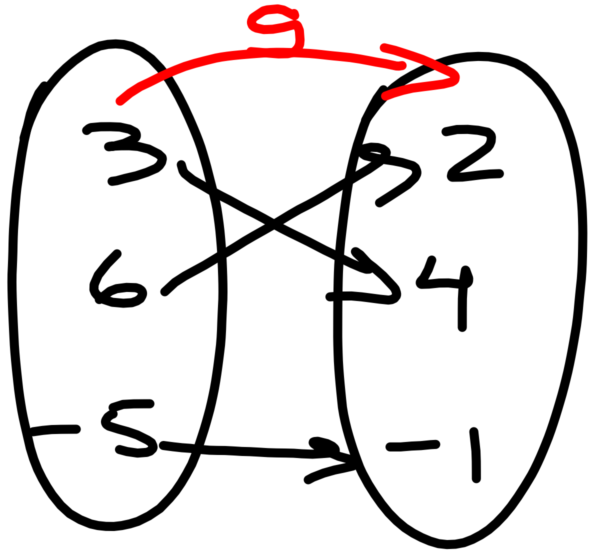
Not One-to-one

Not 1-1

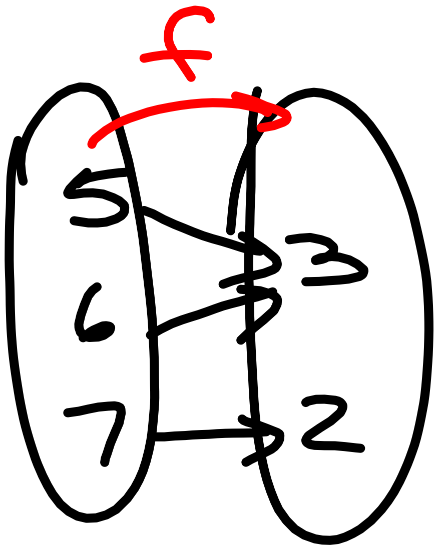


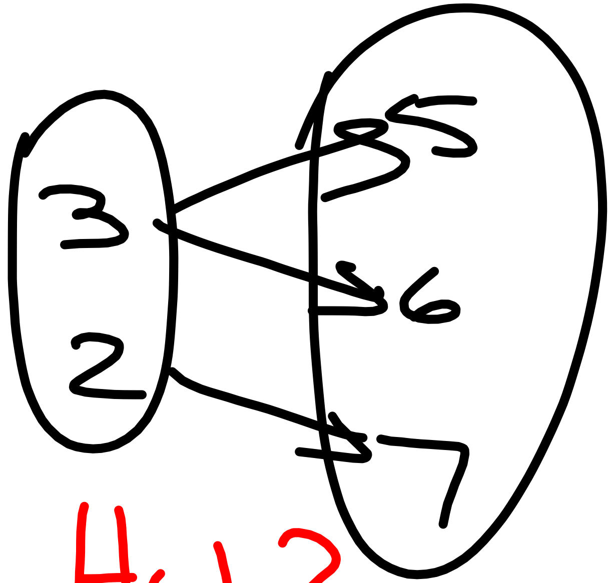
Not a fnct.





f & g are inverses.



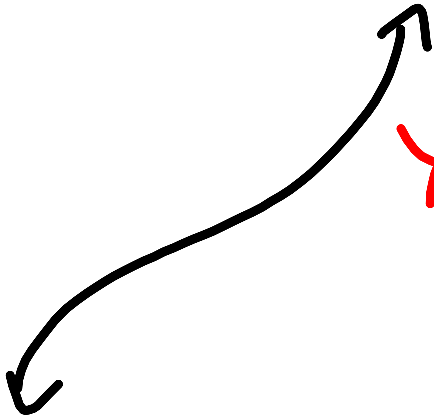


Huh?

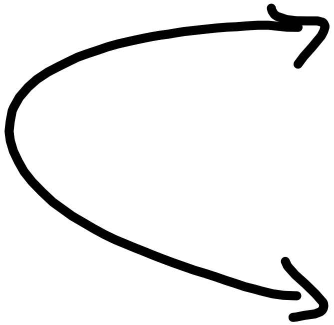
No inverse

Does the fnct. have an inverse.

No



Yes



Not a fnct.

Notation

$f \Longrightarrow f^{-1}$

f inverse

How to find f^{-1}

Given $f(x) = 2x - 5$

$$y = 2x - 5$$

$$x = 2y - 5$$

$$x + 5 = 2y$$

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

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

$$f(x) = x^3 - 1$$

$$y = x^3 - 1$$

$$x = y^3 - 1$$

$$x + 1 = y^3$$

$$y = \sqrt[3]{x+1}$$

$$f^{-1}(x) = \sqrt[3]{x+1}$$