**Panel 1 (top-left):**

Use these two functions:

$$f(x) = (x + 2)^3 - 1 \qquad g(x) = \sqrt[3]{x + 1} - 2$$

1. Find f(g(x)).  Simplify as much as possible.

$$f(g(x)) = \left(\sqrt[3]{x+1} - 2 + 2\right)^3 - 1$$

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

$$= x + 1 - 1 \qquad = \bigotimes X$$

**Panel 2 (top-right):**

Using the same two functions

$$f(x) = (x + 2)^3 - 1 \qquad g(x) = \sqrt[3]{x + 1} - 2$$

2. Find g(f(x)).  Simplify as much as possible.

$$g(f(x)) = \sqrt[3]{(x+2)^3 - 1 + 1} \quad - 2$$

$$= \sqrt[3]{(x+2)^3} \quad - 2$$

$$= x + 2 - 2 = \bigotimes X$$

**Panel 3 (bottom-left):**

Whenever   f(g(x))=x   and   g(f(x))=x

the functions f(x) and g(x) are called INVERSES

**Panel 4 (bottom-right):**

Are these functions inverses?

Only if   f(g(x)) = x   AND   g(f(x)) = x

$$f(x) = \frac{x+1}{x} + 5 \qquad\qquad g(x) = \frac{1}{x-6}$$

Find f(g(x)):  
$$= \frac{\frac{1}{x-6} + 1}{\frac{1}{x-6}} + 5$$

now simplify

$$= \frac{x-6}{x-6} \cdot \frac{\left(\frac{1}{x-6} + 1\right)}{\frac{1}{x-6}} + 5$$

$$= \frac{1 + x-6}{1} + 5 = \frac{x-5}{1} + 5 = x - 5 + 5$$

$$= \bigotimes X$$

$$f(x) = \frac{x+1}{x} + 5 \qquad g(x) = \frac{1}{x-6}$$

Find g(f(x)):

$$= \frac{1}{\frac{x+1}{x} + 5 - 6} = \frac{1}{\frac{x+1}{x} - 1}$$

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

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since f(g(x)) = x    AND  g(f(x)) = x

f(x) and g(x)   MUST be INVERSES!

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Hwk #11       Sec 7-6

Pages 401

Problems:   25, 30, 39, 40, 66, 68

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You have two coupons to use, one is for 10% off and the other is for $20 off. If you are allowed to use both coupons on the same item does it matter which one you use first?  If yes, which one should you use first?

$20 off function:         x = original price       10% off function:
f(x) = x - 20                                        g(x) = 0.9x

10% off first:
f(g(x)) = $.9x - 20$

$20 off first:
g(f(x)) = $.9(x - 20)$
$= .9x - 18$

It's best to use the 10% off coupon first since you get the full benefit of the $20 off coupon.

If you use the $20 off coupon first you end up getting the equivalent of only $18 off.

SEC 7-7 Exploration

By definition a Relation is a set of ordered pairs
(a bunch of points)

What is a function?

A relation such that every x-value is paired with
one and only one y-value.