

# **Algebra II**

10-3

## **Compositions and Inverses of Functions**

## Composition of Functions -

When the result of a function (or the function itself) is the input for another function.

The following function is composed of three separate functions.  
What are they?

$$F(10) = 3(10)^2 - 7$$

$$f(x) = 3x^2 - 7$$

$$a(x) = x^2$$

$$b(x) = 3x$$

$$c(x) = x - 7$$

Oral Exercises (pg 465)

$$f(x) = 3x$$

$$g(x) = x + 1$$

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

$$3a) f(h(2)) = h(2) = (2)^2 + 2 = 6$$

$$F(6) = 3(6) = 18$$

$$2b) g(f(5)) = f(5) = 3(5) = 15$$

$$g(15) = (15) + 1 = 16$$

$$3c) f(h(x)) = F(x^2 + 2) = 3(x^2 + 2) = 3x^2 + 6$$

$$1d) f(g(x)) = F(x + 1) = 3(x + 1) = 3x + 3$$

## Inverse of a function

Blue Collar Definition - Two functions are inverses if  
they undo each other.

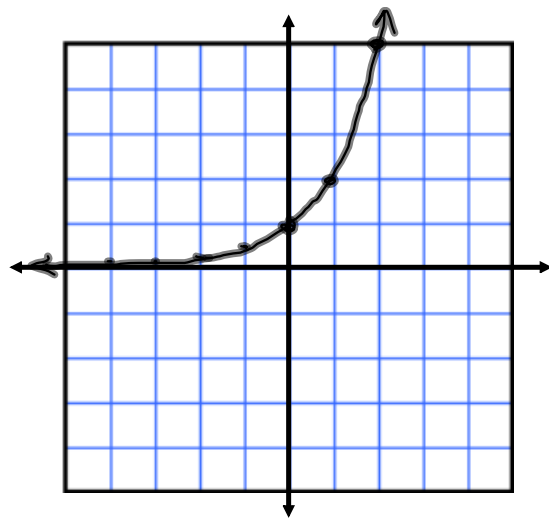
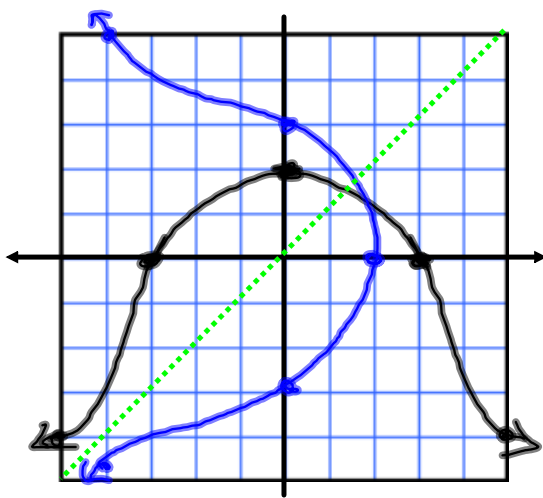
Graphical Definition - Two functions are inverses if

swap  $x$  +  $y$  s  
 $(1,2) \rightarrow (2,1)$

Mathematician's Definition - Two functions  $f(x)$  and  $g(x)$   
are inverses iff

$$\begin{aligned} 1) f(g(x)) &= x \\ 2) g(f(x)) &= x \end{aligned}$$

Sketch the inverse of each graph. Is the inverse a function?



Find the inverse of each function. Is the inverse a function?

\*1)  $f(x) = 3x + 7$

$$y = 3x + 7$$

$$x = 3y + 7$$

$$x - 7 = 3y$$

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

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

\*2)  $g(x) = 9x^2$

$$y = 9x^2$$

$$x = 9y^2$$

$$\sqrt{\frac{x}{9}} = \sqrt{y^2}$$

$$\frac{\sqrt{x}}{3} = |y|$$

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

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1-22 all

(For graphs, Make  
Rough Sketches)