1.4 Building Functions from Functions

Target 1C: Build functions from functions (using sum, difference, multiplication, division, composition, & inverse)

Review of Prior Concepts

1. If $f(g(x)) = (x+2)^5$, find the two functions, $f(x)$ and $g(x)$.

2. If $f(x) = x^2 - 4$ and $g(x) = x^2 - 5x - 14$, state the domain of $\left(\frac{f}{g}\right)(x)$.

More Practice

Operations on Functions

http://home.windstream.net/okrebs/page42.html
https://www.math10.com/en/algebra/functions/operations-on-functions.html
https://www.youtube.com/watch?v=z8T-QeTVDuQ

SAT Connection

Passport to Advanced Math

14. Use structure to isolate or identity a quantity of interest

Example:

A function f satisfies $f(2) = 3$ and $f(3) = 5$. A function g satisfies $g(3) = 2$ and $g(5) = 6$. What is the value of $f(g(3))$?

A) 2

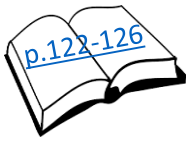
B) 3

C) 5

D) 6

Solution

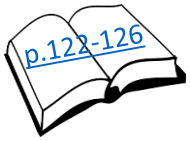
Inverses Numerically



- An ordered pair (a, b) is in a relation if and only if the ordered pair (b, a) is in the **inverse** relation.

  Example 1: Find the inverse of $f(x) = \{(1,3), (2,5), (-4,2), (7,0)\}$

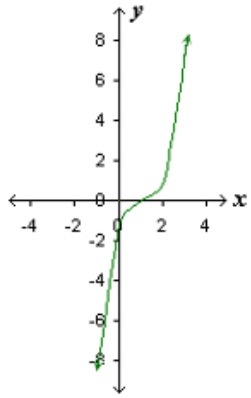
Inverses Graphically

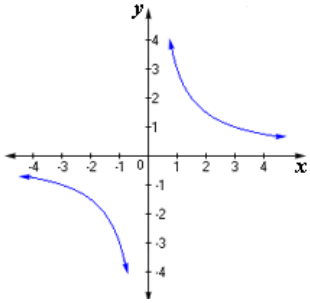


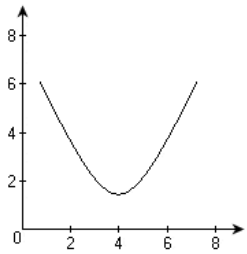
The inverse is a reflection of the function across the line $y = x$.

The notation for the inverse of a function, $f(x)$, is $f^{-1}(x)$.

Example 2: Draw the inverse as a reflection across the line $y = x$.



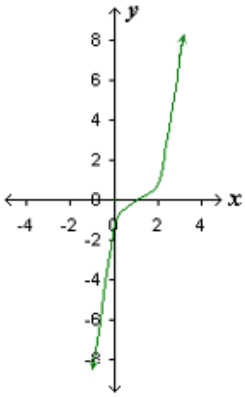


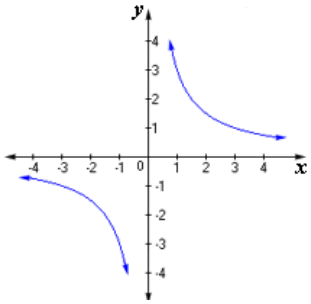


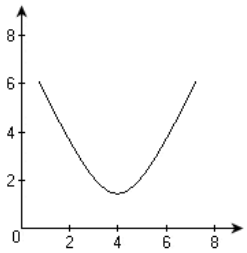
RECALL:
A relation is a function if it passes _____

- The inverse of a relation is a function if the relation passes _____
- If original relation and inverse are both functions, then the function is called _____

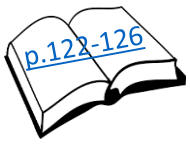
Example 3: Is the relation a function? Is the inverse a function? Is the function one-to-one?







Inverses Algebraically



1) Determine that $f(x)$ is one-to-one (or put any restrictions on the domain).
2) Switch x & y.
3) Solve for y and write with $f^{-1}(x)$ notation

Examples:

Find the inverse of each function.

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

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

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

Determine if $f(x)$ and $g(x)$ are inverses. Show if $\boldsymbol{f(g(x)) = g(f(x)) = x}$

4) $f(x) = 5x - 2,\ g(x) = \frac{x+2}{5}$

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

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

More Practice

Inverse Functions

http://www.regentsprep.org/regents/math/algtrig/atp8/inverselesson.htm
http://tutorial.math.lamar.edu/Classes/CalcI/InverseFunctions.aspx
http://www.mathcentre.ac.uk/resources/uploaded/mc-ty-inverse-2009-1.pdf
https://www.youtube.com/watch?v=gXIRspXL6oc
https://www.youtube.com/watch?v=JPPitlVKjWQ

Homework Assignment

p.127 #39,40,43,46,51,53,56,57,61

SAT Connection
Solution

Choice B is correct. It is given that $g(3) = 2$. Therefore, to find the value of $f(g(3))$, substitute 2 for $g(3)$: $f(g(3)) = f(2) = 3$.

Choices A, C, and D are incorrect and may result from misunderstandings about function notation.