

1-2 Function Analysis

Learning Objectives:

1. I can find the domain and range of a function.
2. I can classify functions as even, odd, or neither.
3. I can find the composite function involving two functions.
4. I can find the inverse of a function.
5. I understand the graphical relationship between a function and its inverse.
6. I can graph linear, power, absolute value, piecewise, and step functions.

Composite of Functions

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

$$g(x) = x - 5$$

$$f \circ g = f(g(x)) = (x - 5)^2$$

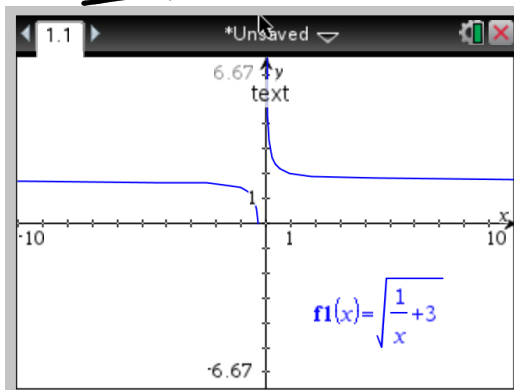
$$g \circ f = g(f(x)) = x^2 - 5$$

Ex1. Given $f(x)$ and $g(x)$, find $f \circ g$ and $g \circ f$ and state the domain and range of each

$$f(x) = \sqrt{x+3}$$

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

$f(g(x))$

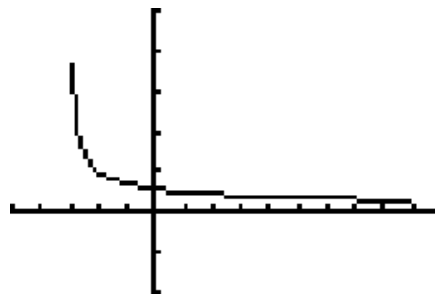


$$D: (-\infty, -\frac{1}{3}] \text{ \& } (0, \infty)$$

$$R: [0, \sqrt{3}) \text{ \& } (\sqrt{3}, \infty)$$

$g(f(x))$

Plot1 Plot2 Plot3
 $Y_1 = 1/\sqrt{X+3}$
 $Y_2 =$
 $Y_3 =$
 $Y_4 =$
 $Y_5 =$
 $Y_6 =$



$$D: (-3, \infty)$$

$$R: (0, \infty)$$

Even/Odd Functions

A function is an Even Function

if $f(-x) = f(x)$ for all x

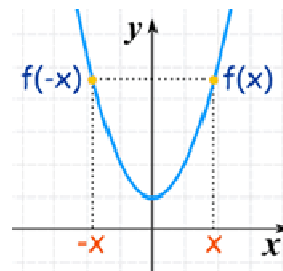
$$y = x^2$$

$$y = x^4$$

$$y = x^6$$

$$y = |x|$$

$$y = \cos(x)$$



A function is an Odd Function

if $f(-x) = -f(x)$ for all x

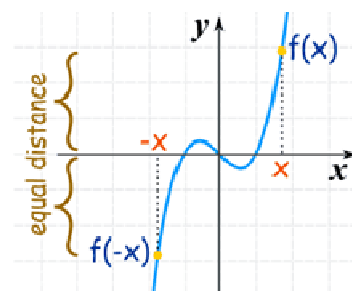
$$y = x^1$$

$$y = x^3$$

$$y = x^5$$

$$y = \sin x$$

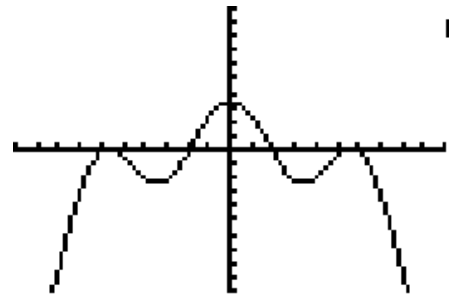
$$y = \frac{1}{x}$$



Ex2. Decide if the given function is even, odd, or neither

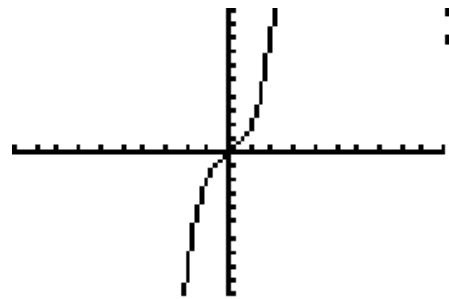
1. $f(x) = |x| - \frac{1}{4}x^2 + 3\cos(x)$

even



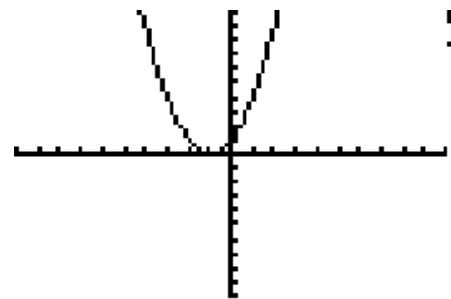
2. $g(x) = x^3 + \sin(x)$

odd



3. $y = x^2 + 2x + 1$

neither



Inverses

To find the inverse of a function, switch the x and y and solve for y .

Ex3. Find the inverse

$$y = f(x) = x^2 + 4x + 4$$

$$x = y^2 + 4y + 4$$

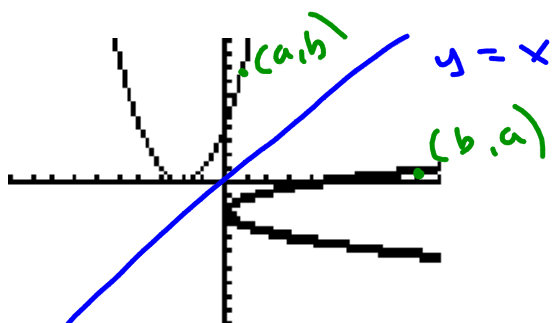
$$(y+2)(y+2)$$

$$\sqrt{(y+2)^2} = \sqrt{x}$$

$$y+2 = \pm\sqrt{x}$$

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

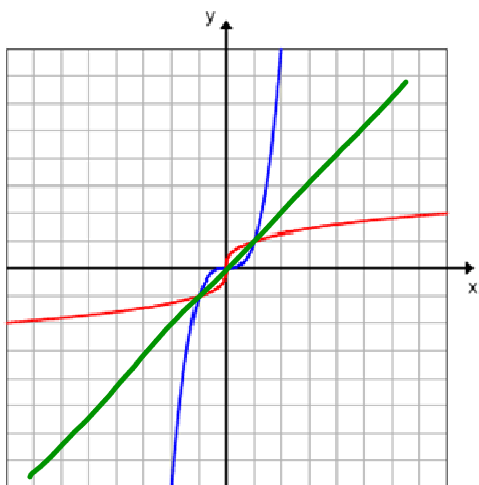
$$f^{-1}(x) = y = \pm\sqrt{x} - 2$$



Now graph $y = f(x)$ and $y = f^{-1}(x)$
on the same axes.

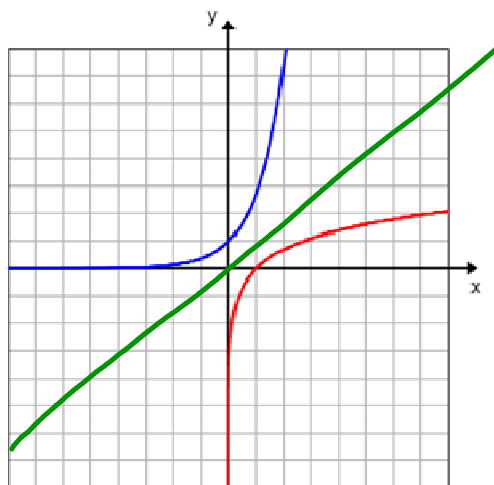
$$f(x) = x^3$$

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



$$f(x) = e^x$$

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



If $f(x)$ and $f^{-1}(x)$ are inverses,
then $f \circ f^{-1}(x) = f^{-1} \circ f(x) = x$

$$f(f^{-1}(x)) = f^{-1}(f(x)) = x$$

For example:

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

$$(\sqrt[3]{x})^3 = (\sqrt[3]{x})^3 = x$$

Homework

pg 19 # 21 – 30, 37 – 40, 50 – 52,
56

Pg 44 # 13, 15, 16, 18, 22