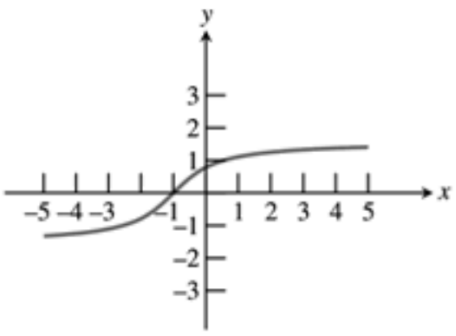
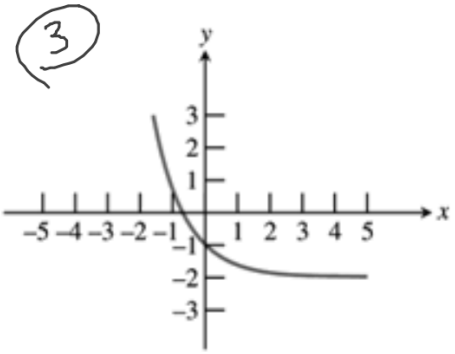
Warm Up-Identify the domain and range of each using interval notation.

1

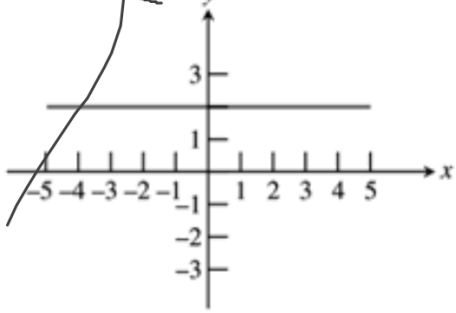


3

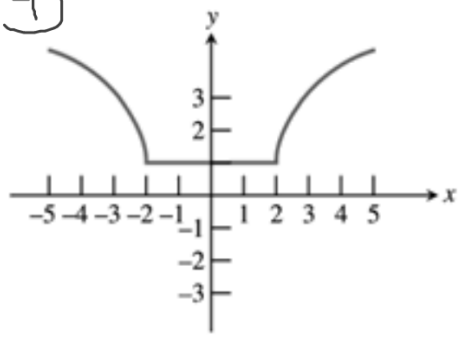


2

$(-\infty, \infty)$ $[2]$



4



Section 1.5: Inverse Relations.

Inverse Relation

"Switch x and y"

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

X^{-1}

$f^{-1}(x)$

Inverse Function

If f is a one-to-one function with domain D and range R, then the **inverse function of f**, denoted f^{-1}, is the function with domain R and range D defined by $f^{-1}(b) = a$ if and only if $f(a) = b$.

Example **Finding an Inverse Function Algebraically**

Find an equation for $f^{-1}(x)$ if $f(x) = \frac{2x}{x-1}$.

$x = \frac{2y}{y-1}$ Switch the x and y

Solve for y:

$x(y-1) = 2y$ Multiply by $y-1$

$xy - x = 2y$ Distribute x

$xy - 2y = x$ Isolate the y terms

$y(x-2) = x$ Factor out y

$y = \frac{x}{x-2}$ Divide by $x-2$

Therefore $f^{-1}(x) = \frac{x}{x-2}$.

$f^{-1}(x)$

$y = \frac{2x}{x-1}$

$(y-1)x = \frac{2y}{y-1} \cdot (y-1)$

$x(y-1) = 2y$

$xy - x = 2y$

$xy - 2y = x$

$y(x-2) = x$

$y^{-1} = \frac{x}{(x-2)}$

The Inverse Composition Rule

A function f is one-to-one with inverse function g if and only if
$f(g(x)) = x$ for every x in the domain of g, and
$g(f(x)) = x$ for every x in the domain of f.

Example **Verifying Inverse Functions**

Show algebraically the $f(x) = x^3 + 2$ and $g(x) = \sqrt[3]{x-2}$ are inverse functions.

$f(x) = x + 2 \quad g(x) = \sqrt{x-2}$

$f(g(x))$

$f(\sqrt{x-2})$

$(\sqrt{x-2}) + 2$

$\sqrt{x-2} + 2$

$\neq x$

$g(f(x))$

$g(x+2)$

$\sqrt{(x+2)-2}$

$\sqrt{x+2-2} = \sqrt{x}$

$\neq x$