A More Mathematical Definition of a Function

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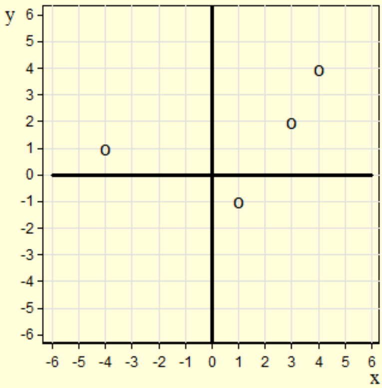
- According to the definition, is g a function?

$$\begin{Bmatrix} 0 \\ 4 \\ 9 \end{Bmatrix} \to g \to \begin{Bmatrix} 0 \\ -2 \text{ or } 2 \\ -3 \text{ or } 3 \end{Bmatrix}$$

Discrete Functions

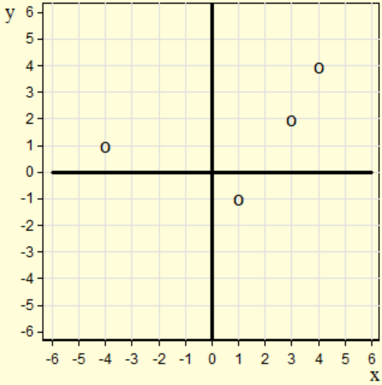
A graph of the discrete function, k



Domain of a Discrete Function

Based on the graph, what is the domain of this discrete function, k?

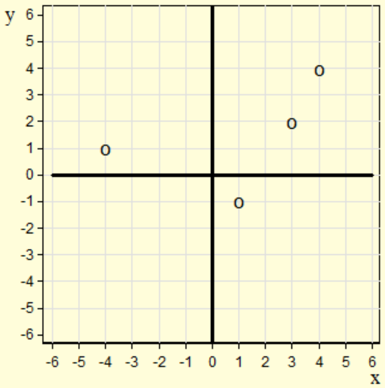
A graph of the discrete function, k



Range of a Discrete Function

Based on the graph, what is the range of this discrete function, k?

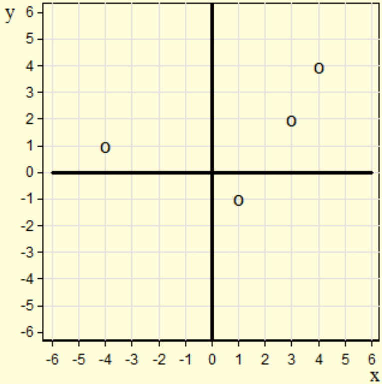
A graph of the discrete function, k



Application with a Discrete Function

Calculate: $4k(1) + k(-4)$

A graph of the discrete function, k



Domain of a Continuous Function

Based on the graph, what are the domains of $g(x)$ and $h(x)$, respectively?

Range of a Continuous Function

Based on the graph, what are the ranges of $g(x)$ and $h(x)$, respectively?

Application of a Continuous Function

Calculate: $2h(0) - g(4)$

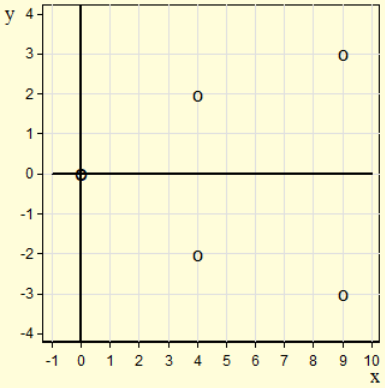
Application of a Continuous Function

Let $f(x) = g(x) + h(x)$
Draw $f(x)$ on the diagram

The Vertical Line Test

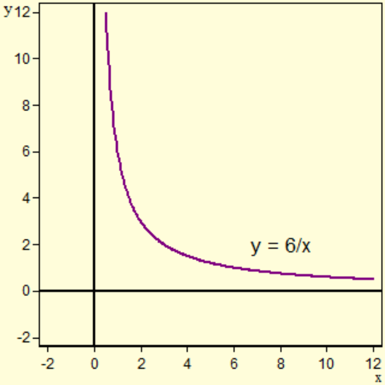
$$\begin{Bmatrix} 0 \\ 4 \\ 9 \end{Bmatrix} \to g \to \begin{Bmatrix} 0 \\ -2 \text{ or } 2 \\ -3 \text{ or } 3 \end{Bmatrix}$$

A graph of the Discrete Function g



The Vertical Line Test

Is this expression a function?



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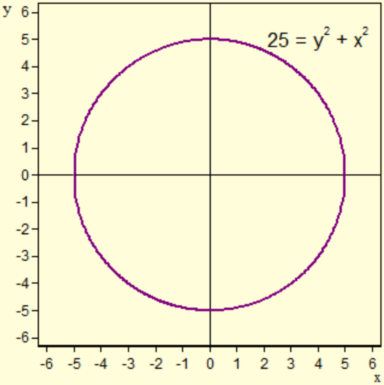

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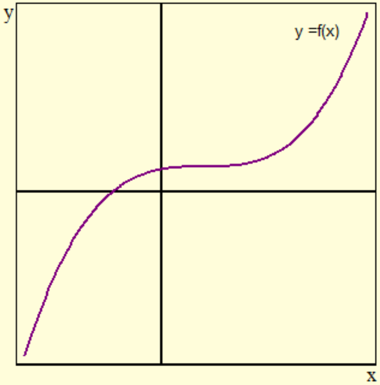

Find the domain of:

$$f(x) = \frac{1}{x+5}$$

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

One-to-One Functions

A function is one-to-one if each element of the range corresponds to exactly one element of the domain.

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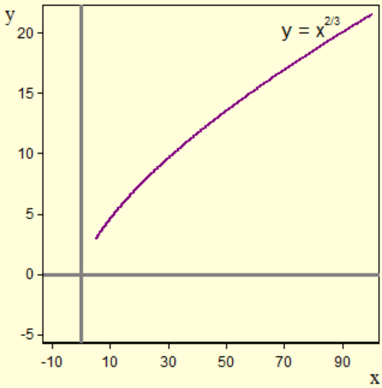
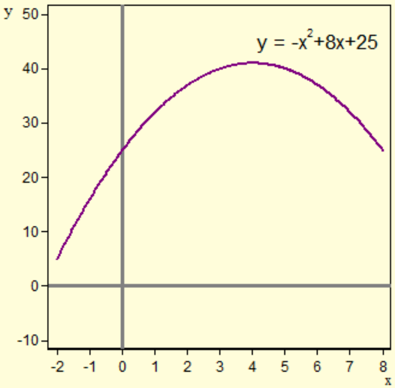


The H-Line Test

A function is one-to-one if each element of the range corresponds to exactly one element of the domain.

Is this a one-to-one function?



Inverse and One-to-One Functions

An one-to-one function, $f(x)$, has an inverse function. This inverse function, $f^{-1}(x)$, reverses the mapping!

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Example: Consider the following one-to-one discrete function:

$g = \{(-5, 3), (-2, 5), (1, 4), (2, -4)\}$

Find g^{-1}, the inverse of g.

Functions: Consider the following one-to-one functions:

$h(x) = 3x + 6$

Find the inverse function, h^{-1}

Inverse Functions

A function and its inverse have a special property. If $f(x)$ is a function and $f^{-1}(x)$ is its inverse, then:

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

Inverse Functions

Example: A model of supply and demand states that the quantity of rice a farmer is willing to produce depends on price: $Q_s(P) = 2P$. Find the inverse of $Q_s(P)$ and show that $Q_s(Q_s^{-1}(P)) = P$.

Example: an Inverse Demand Function

The number of sushi meals eaten by customers in a month (Q) depends on its price (P): $Q = 4000 - 2P(Q)$

Find the inverse demand function, $P(Q)$ and show that $P(P^{-1}(Q)) = Q$. Illustrates the functions using a graph in Excel.

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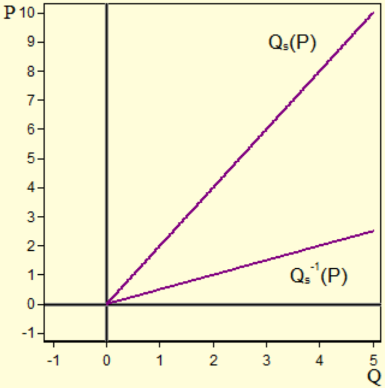

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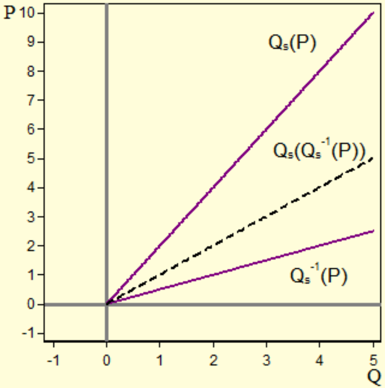

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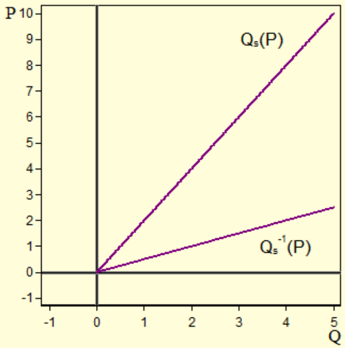

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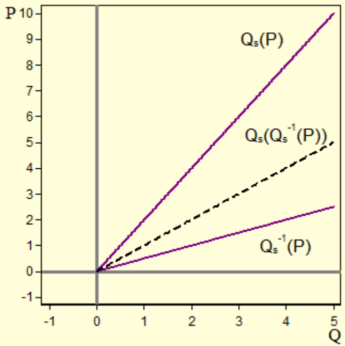

Graphing Solutions to a System of Two Linear Equations

Consider the following supply and demand functions:

$$\begin{aligned} Q_d &= 4000 - 20P \\ Q_s &= 1000 + 30P \end{aligned}$$

Using Excel, graph the system for the price (P) and quantity when $Q_d = Q_s$ (this is known as equilibrium in economics). Have price on the y-axis and quantity on the x-axis.

Graphing Solutions to a System of Two Linear Equations

Consider the following revenue function, $R(Q)$, and cost function, $C(Q)$ where Q is the quantity of output.

$$\begin{aligned} R(Q) &= 2Q \\ C(Q) &= 0.01Q^2 \end{aligned}$$

Using Excel, graph the revenue and cost function. Looking at your graph, what quantity of output, Q, maximizes profit?