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Analyzing Graphs of Functions and Relations Guided Notes

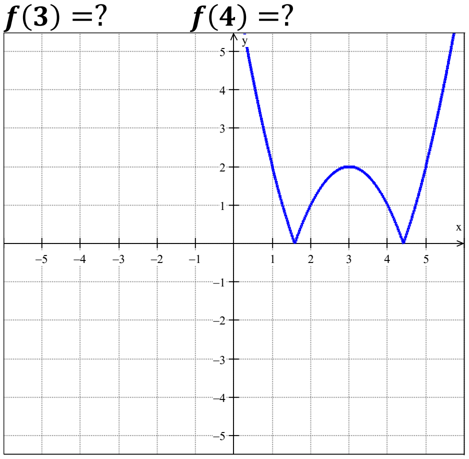
The graph of a function $\boldsymbol{f}$ is the set of ordered pairs $(\boldsymbol{x}, \boldsymbol{f}(\boldsymbol{x}))$, in the coordinate plane, such that $\boldsymbol{x}$ is the domain of $\boldsymbol{f}$.
$\boldsymbol{x}-$ the directed distance from the $\boldsymbol{y}$ -axis $\quad$ $\boldsymbol{y}=\boldsymbol{f}(\boldsymbol{x})-$ the directed distance from the $\boldsymbol{x}$ -axis

You can use the graph to estimate function values.

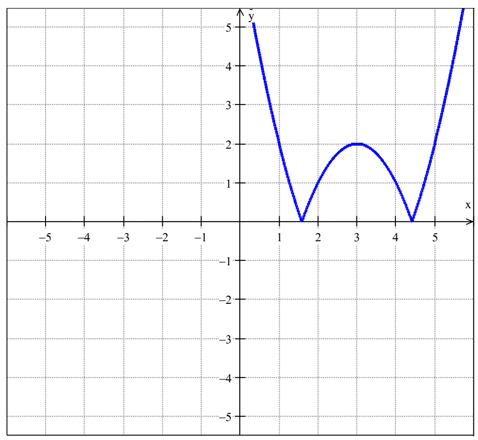
Sample Problem 1: Use a graph of each function to estimate the indicated function values. Then find the values algebraically.

a. $\boldsymbol{f}(\boldsymbol{x})=|(\boldsymbol{x}-\mathbf{3})^2-\mathbf{2}|$

$\boldsymbol{f}(\mathbf{3})=?$ $\quad$ $\boldsymbol{f}(\mathbf{4})=?$



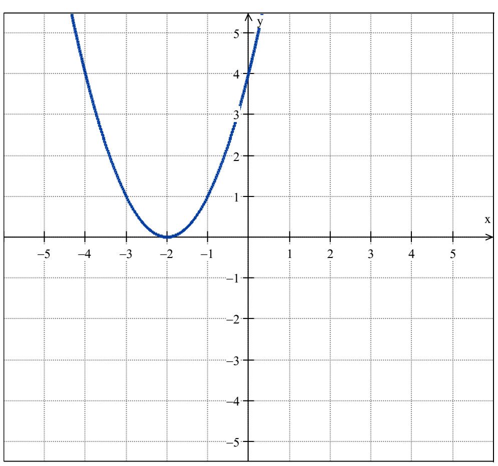
Graphically



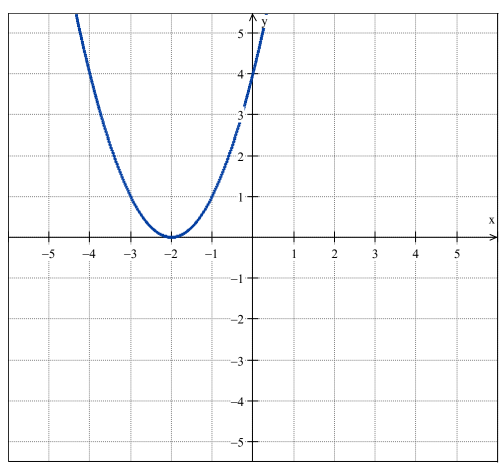
Algebraically

b. $\boldsymbol{f}(\boldsymbol{x})=\boldsymbol{x}^2+\mathbf{4}\boldsymbol{x}+\mathbf{4}$

$\boldsymbol{f}(\mathbf{0})=?$ $\quad$ $\boldsymbol{f}(-\mathbf{2})=?$ $\quad$ $\boldsymbol{f}(-\mathbf{4})=?$



Graphically



Algebraically

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Analyzing Graphs of Functions and Relations Guided Notes

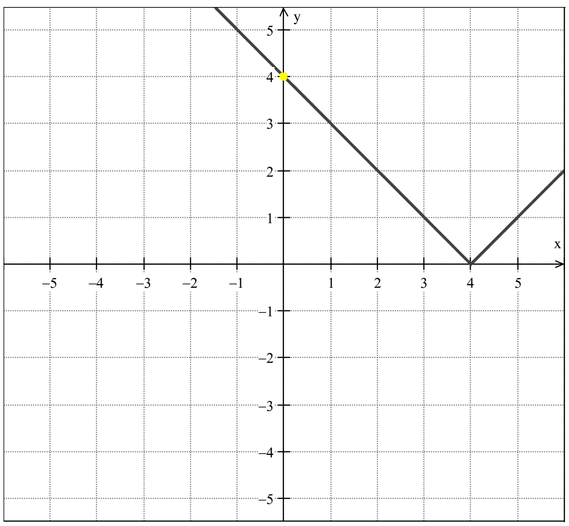
Identifying Intercepts from a Functions Graph

A point where the graph intersects or meets the x or y axis is called **an intercept.**

An x-intercept occurs where $y = 0$.   A y-intercept occurs where $x = 0$.

Sample Problem 2: Use the graph of each function to approximate its y–intercept. Then find the y–intercept algebraically.

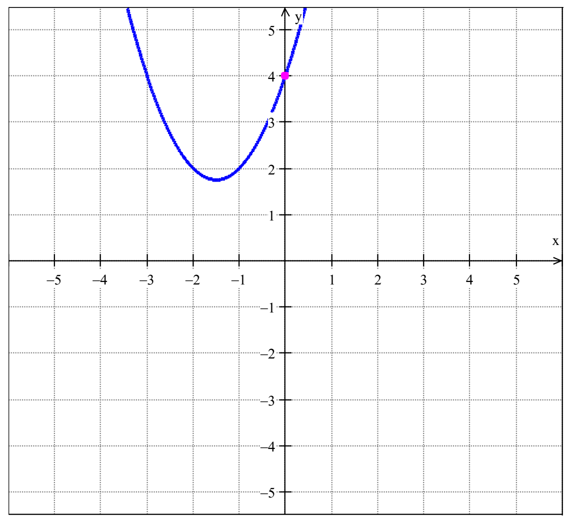
a. $g(x) = |x - 4|$



Graphically

Algebraically

b. $f(x) = x^2 + 3x + 4$



Graphically

Algebraically

Zeros of a Function

The zeros of function $f(x)$ are x–values for which $f(x) = 0$

If the graph of a function of x has an x-intercept at $(x, 0)$ then x is a zero of the function.

To find the zeros of a function, set the function equal to zero and solve for the independent variable.

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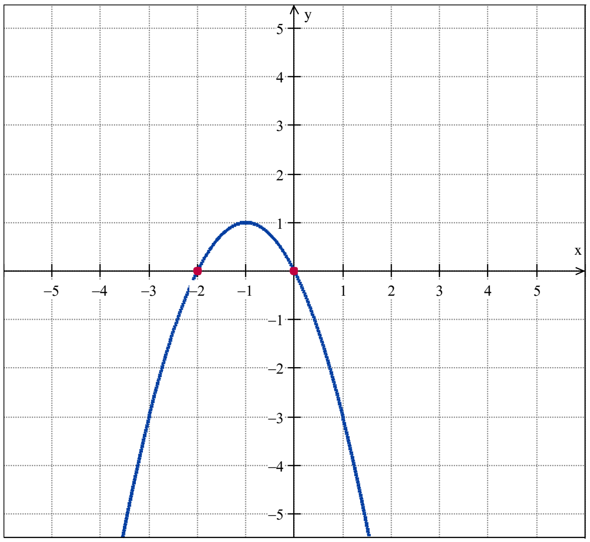
Analyzing Graphs of Functions and Relations Guided Notes

Sample Problem 3: Use the graph of each function to approximate its zeros. Then find the zeros of each function algebraically.

a. $f(x) = -x^2 - 2x$
$Zeros\ =?$

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

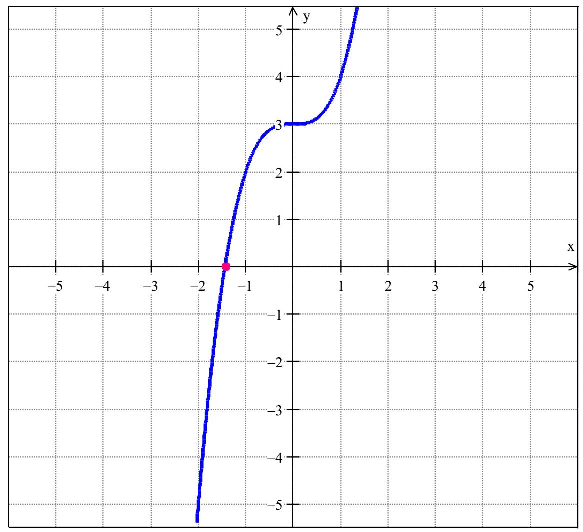


Graphically

Algebraically

b. $f(x) = x^3 + 3$
$Zeros\ =?$

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



Graphically

Algebraically

Symmetry of Graphs

There are two possible types of symmetry that graphs of functions can have.

1. **Line symmetry** - graphs can be folded along a line so that the two halves match exactly.

2. **Point symmetry** - graphs can be rotated 180° with respect to a point and appear unchanged.

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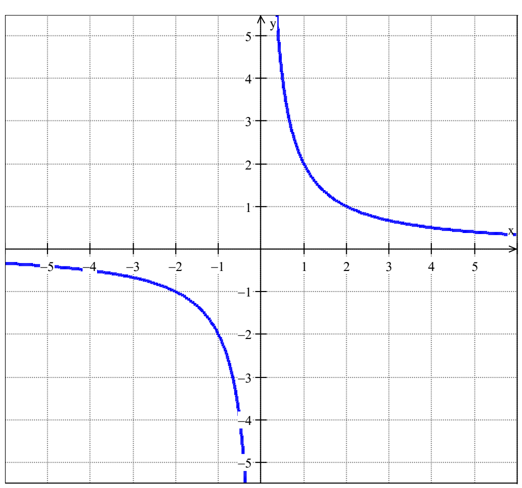
Analyzing Graphs of Functions and Relations Guided Notes

Tests for Symmetry

Graphical Test	**Algebraic Test**
The graph of a relation is symmetric with respect to the x-axis if and only if for every point (x, y), on the graph, the point $(x, -y)$, is also on the graph.	Replacing y with - y produces an equivalent equation.
The graph of a relation is symmetric with respect to the y-axis if and only if for every point (x, y)on the graph, the point $(-x, y)$is also on the graph.	Replacing x with - x produces an equivalent equation.
The graph of a relation is symmetric with respect to the origin if and only if for every point (x, y) on the graph, the point $(-x, -y)$is also on the graph.	Replacing x with - x and y with - y produces an equivalent equation.

Sample Problem 4: Use the graph of each equation to test for symmetry with respect to the x-axis, y-axis, and the origin. Support the answer numerically. Then confirm algebraically.

a. $y = \dfrac{2}{x}$



Graphically

Support Numerically

x						
y						
(x, y)						

Algebraically

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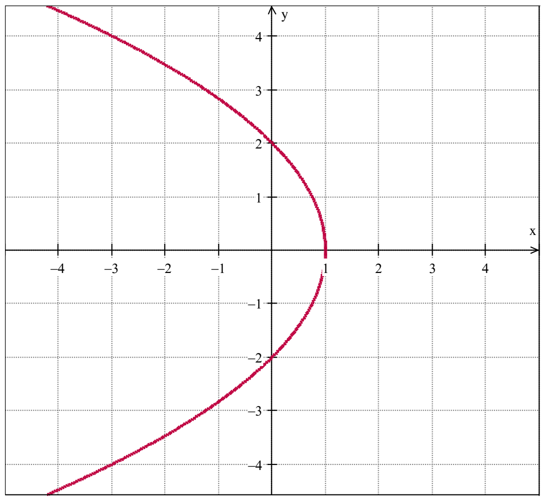
b. $4x + y^2 = 4$



Graphically

Support Numerically

x				
y				
(x, y)				

Algebraically

Identify Even and Odd Functions

If $f(-x) = f(x)$, then the function is even, and symmetric to the y-axis.

If $f(-x) = -f(x)$, then the function is odd, and symmetric to the origin.

Sample Problem 5: **Determine whether the following are even, odd, or neither.**

a. $f(x) = x^4 + 4$

Analyzing Graphs of Functions and Relations Guided Notes

b. $g(x) = 9x^5 - x^3$

c. $h(t) = t^2 + t$

