

3.2 The Graph Functions

▼ Vertical Line Test: A graph in the Cartesian plane is the graph of a function if and only if no vertical lines intersects the graph more than once.

▼ What is it used for?

The vertical line test is used to determine if a graph represents a function.

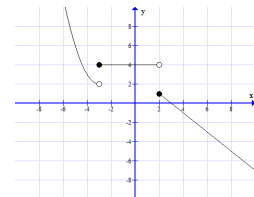
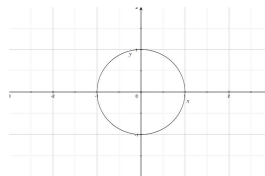
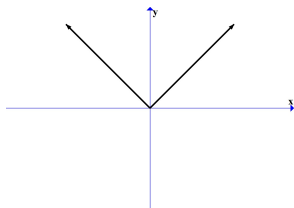
▼ Why use a vertical line?

A vertical line violates the definition of a function since it has one x-value and infinite y values

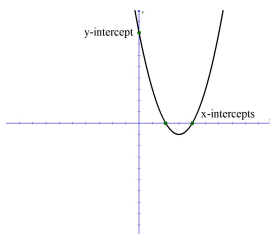
▼ How to use it?

Draw vertical lines on the graph. Count the number of intersection points. If there is more than one intersection point on any vertical line, the graph is not a function. If every vertical line has one or no intersection points then the graph represents a function.

▼ Examples: Does the graph represent a function?



▼ Intercepts



An **x-intercept** is the ordered pair where the graph crosses or touches the x-axis.

To find an x-intercept, let $y=0$.

A **y-intercept** is the ordered pair where the graph crosses or touches the y-axis.

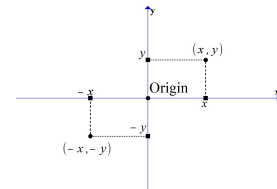
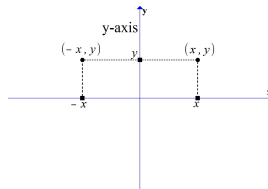
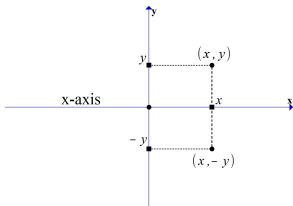
To find a y-intercept, let $x=0$

▼ Domain and Range

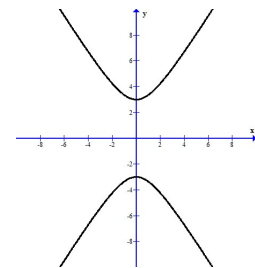
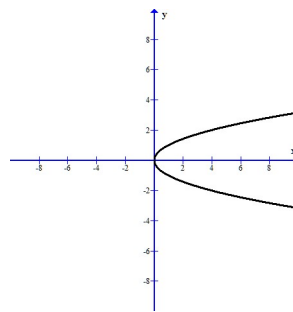
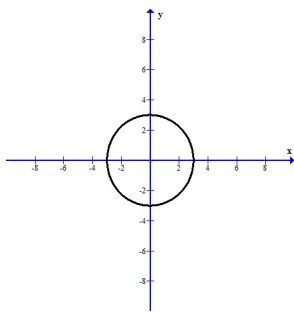
The **domain** is the set of all first coordinates. (x 's)

The **range** is the set of all second coordinates. (y 's)

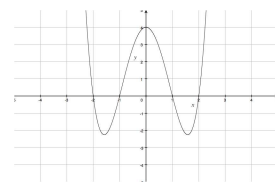
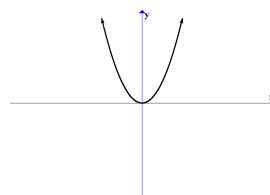
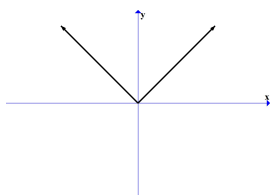
▼ Symmetry



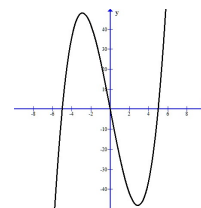
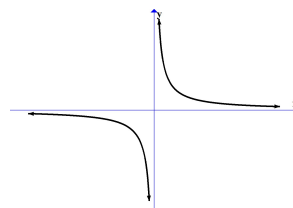
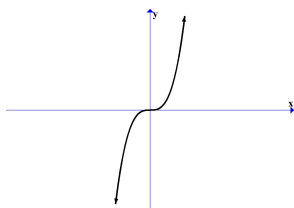
▼ Examples of x-axis symmetry



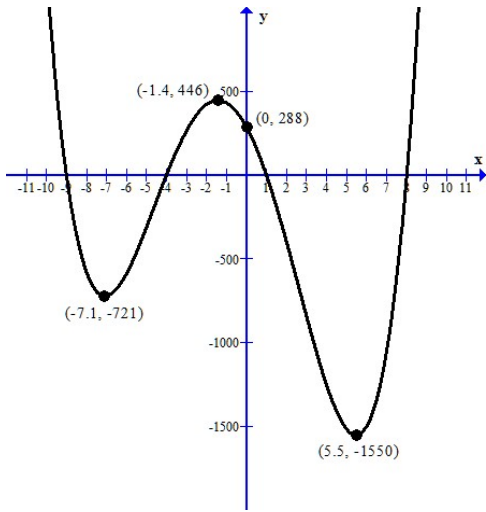
▼ Examples of y-axis symmetry



▼ Examples of origin symmetry

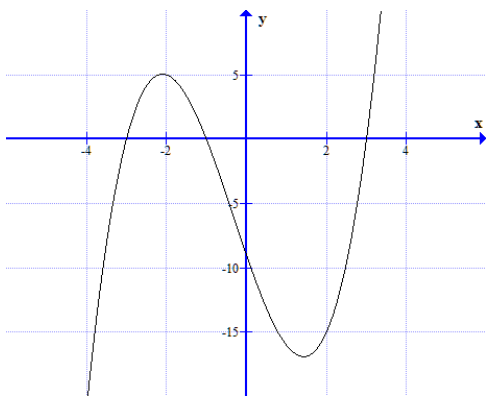


▼ Example: Vertical-line test, domain range, intercepts, symmetry



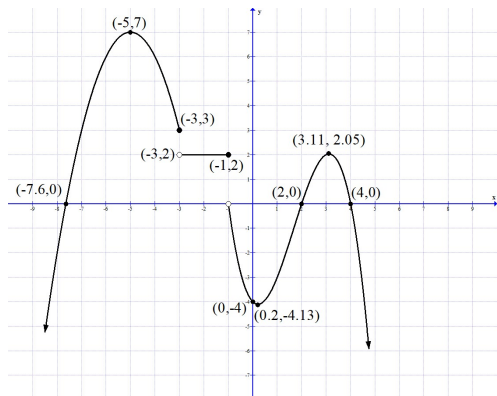
- Does the graph represent a function?
- Find the domain and range.
- Find the intercepts.
- Does the graph have symmetry with respect to the x-axis, y-axis, or the origin?

▼ Example: Vertical-line test, domain range, intercepts, symmetry



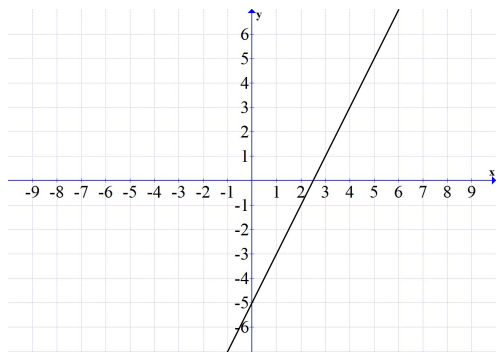
- Does the graph represent a function?
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▼ Example: Locate x 's for which $f(x) \leq 0$ and Intersection points



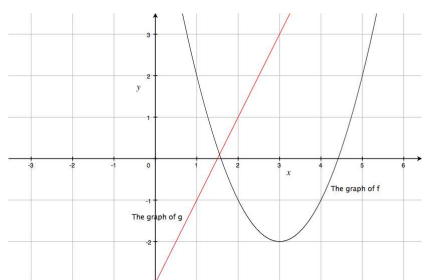
- For what numbers x is $f(x) \leq 0$?
- How often does the line $y = -2$ intersect the graph?

▼ Examples: Function Notation using a graph



- Find $f(1)$
- Find $f(2)$
- Find $f(3)$
- For what x is $f(x) = 3$?
- For what x is $f(x) = -5$?
- For what x is $f(x) = 5$?

▼ Example: Evaluate a Combined Function with a Graph



- $(f + g)(1)$
- $(f - g)(2)$
- $(fg)(3)$
- $\left(\frac{f}{g}\right)(1)$