Section 1.2
Functions and Graphs

Vertical Line Test

A curve is the graph of a function if and only if each vertical line intersects it in at most one point.

Example 1: Determine whether the given graph is the graph of a function.
A. B.

Even and Odd Functions

A function \( f \) is even if \( f(-x) = f(x) \) for all \( x \) in the domain of \( f \). Since an even function is symmetric with respect to the y-axis, the points \((-x, y)\) and \((x, y)\) are on the same graph. *An even function looks the same when reflected about the y-axis.*

This is the graph of the even function \( f(x) = x^2 \). Notice that (-1, 1) and (1, 1) are on the graph.
A function \( f \) is **odd** if \( f(-x) = -f(x) \) for all \( x \) in the domain of \( f \). Since an odd function is symmetric with respect to the origin, the points \((-x,-y)\) and \((x,y)\) are on the same graph. An odd function looks the same when reflected about the x-axis and y-axis or when rotated 180 degrees about the origin.

This is the graph of the odd function \( f(x) = x^3 \). Notice that \((-1, -1)\) and \((1, 1)\) are on the graph.

Example 2: Let \((-3, -7)\) be a point on the graph of \( g \).

a. If \( g \) is an even function, which of the following points is also on the graph of \( g \)?

A. \((3, 7)\)  B. \((-7, -3)\)  C. \((-3, 7)\)  D. \((7, 3)\)  E. \((3, -7)\)

b. If \( g \) is an odd function, which of the following points is also on the graph of \( g \)?

A. \((3, 7)\)  B. \((-7, -3)\)  C. \((-3, 7)\)  D. \((7, 3)\)  E. \((3, -7)\)

Example 3: Determine if the following function is even, odd or neither.

\[ f(x) = 5x^4 - 3x^2 \]

Recall: Even: \( f(-x) = f(x) \)  
Odd: \( f(-x) = -f(x) \)

Try this one: Is \( f(x) = x^3 + 2x + 1 \) even, odd or neither?

Recall: Even: \( f(-x) = f(x) \)  
Odd: \( f(-x) = -f(x) \)

Section 1.2 – Functions and Graphs
A function is **increasing on an interval** whenever \( a > b \) then \( f(a) > f(b) \) (going uphill from left to right).

A function is **decreasing on an interval** whenever \( a > b \) then \( f(a) < f(b) \) (going downhill from left to right).

The **maximum** is the largest \( y \) value for a function.

The **minimum** is the smallest \( y \) value for a function.

Example 4: Given the following graph of a function \( g \):

For parts a – g, state whether the statement is true or false.

a. The domain is \([-3, 6)\).
b. The range is \((-2, 7)\).
c. The y-intercept is 4.
d. The function is decreasing \((0, 1) \cup (3, 5)\).
e. \( g(x) = 0 \) when \( x = -2 \)
f. The maximum of the function is 7.
g. The minimum of the function is -3.