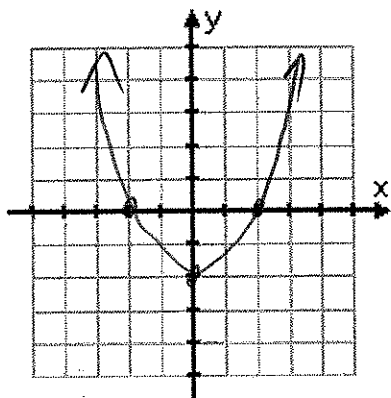
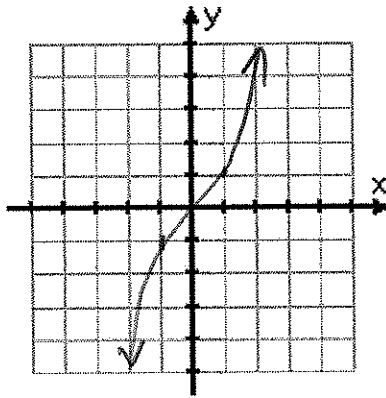


## Symmetry and Even/Odd Functions

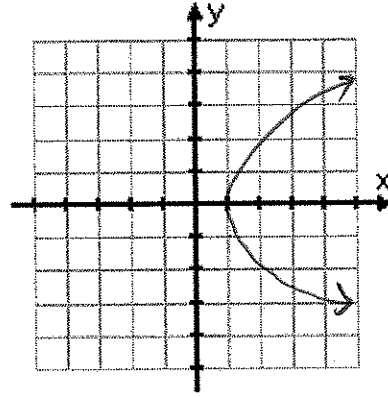
There are three different types of graph symmetry:



y-axis symmetry  
EVEN function



origin symmetry  
ODD function



x-axis symmetry  
but  
NEITHER even nor odd

- A function is **even** if the function is symmetric about the y-axis;  
this means  $f(-x) = f(x)$
- A function is **odd** if the function is symmetric about the origin;  
this means  $f(-x) = -f(x)$
- To find out whether the function is even or odd, substitute “-x” for “x” and simplify the function.
  - If it is the SAME as the original, it is even.
  - If it is the OPPOSITE of the original, it is odd

Decide, algebraically, if the following functions are even, odd or neither:

a)  $y = x^4 - x^2 + 3$

$$y = (-x)^4 - (-x)^2 + 3$$

$$= x^4 - x^2 + 3$$

same → **EVEN**

b)  $h(x) = x^5 + 1$

$$y = (-x)^5 + 1$$

$$= -x^5 + 1$$

**NEITHER**

c)  $g(x) = |x| - 2$

$$y = |-x| - 2$$

$$= |x| - 2$$

same → **EVEN**

d)  $g(x) = x^3 - x$

$$y = (-x)^3 - (-x)$$

$$= -x^3 + x = -g(x)$$

**odd**