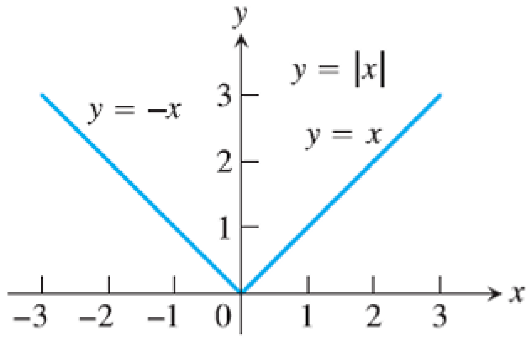
Sometimes a function is described by using different formulas on different parts of its domain. One example is the **absolute value function.**

Example 3:

$$|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0, \end{cases}$$



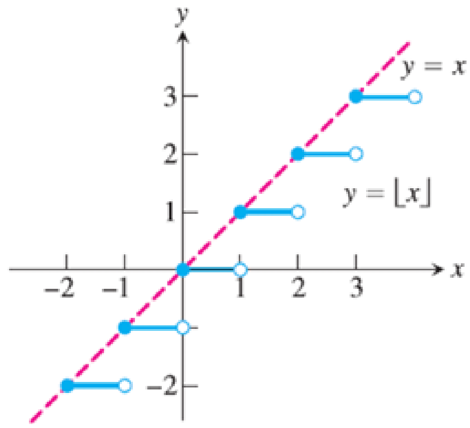
Example 4: the function

$$f(x) = \begin{cases} -x, & x < 0 \\ x^2, & 0 \leq x \leq 1 \\ 1, & x > 1 \end{cases}$$

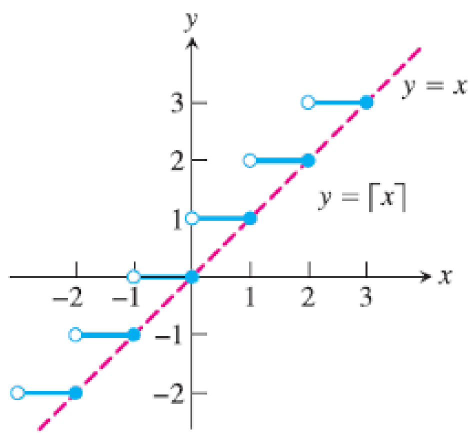
v

Example 5: greatest integer function or **the integer floor function**: The function whose value at any number x is the *greatest integer less than or equal to x*. It is denoted $\lfloor x \rfloor$. Observe that:

$$\lfloor 2.4 \rfloor = 2, \quad \lfloor 1.9 \rfloor = 1, \quad \lfloor 0 \rfloor = 0, \quad \lfloor -1.2 \rfloor = -2,$$
$$\lfloor 2 \rfloor = 2, \quad \lfloor 0.2 \rfloor = 0, \quad \lfloor -0.3 \rfloor = -1 \quad \lfloor -2 \rfloor = -2.$$



Example 6: least integer function or the integer ceiling function: The function whose value at any number x is the *smallest integer greater than or equal to x*. It is denoted $\lceil x \rceil$.



DEFINITIONS Let f be a function defined on an interval I and let x_1 and x_2 be any two points in I.

1. If $f(x_2) > f(x_1)$ whenever $x_1 < x_2$, then f is said to be **increasing** on I.
2. If $f(x_2) < f(x_1)$ whenever $x_1 < x_2$, then f is said to be **decreasing** on I.

EXAMPLE 7: The function graphed in example 4 is decreasing on $(-\infty,0]$ and increasing on $[0, 1]$. The function is neither increasing nor decreasing on the interval $[1,\infty)$.

1.4 Even Functions and Odd Functions: Symmetry

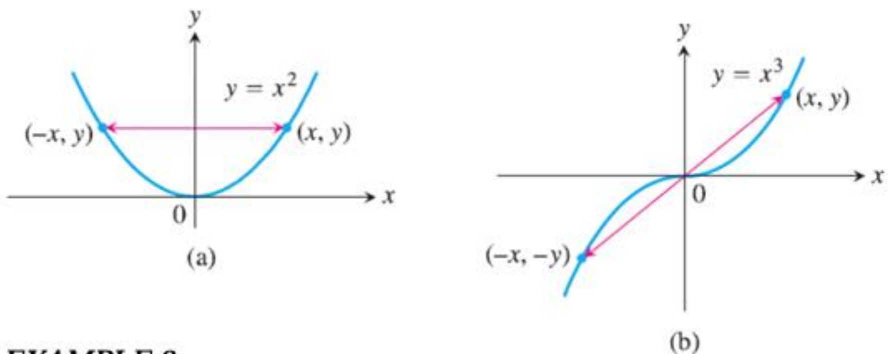
DEFINITIONS A function $y = f(x)$ is an

even function of x if $f(-x) = f(x)$,
odd function of x if $f(-x) = -f(x)$,

for every x in the function's domain.

The graph of an even function is symmetric about they-axis. Since $f(-x) = f(x)$, a point (x,y) lies on the graph if and only if the point (-x, y) lies on the graph . A reflection across the y-axis leaves the graph unchanged.

The graph of an odd function is symmetric about the origin. Since $f(-x) = -f(x)$, a point (x,y) lies on the graph if and on1y if the point $(-x, -y)$ lies on the graph.



EXAMPLE 8:

$f(x) = x^2$	Even function: $(-x)^2 = x^2$ for all x; symmetry about y-axis.
$f(x) = x^2 + 1$	Even function: $(-x)^2 + 1 = x^2 + 1$ for all x; symmetry about y-axis
$f(x) = x$	Odd function: $(-x) = -x$ for all x; symmetry about the origin.
$f(x) = x + 1$	Not odd: $f(-x) = -x + 1$, but $-f(x) = -x - 1$. The two are not equal.

1.5 Common Function