

Transformations of Graphs

Shifts

For $c > 0$,

to obtain the graph of:

$f(x)+c$	shift the graph of $f(x)$	upward c units
$f(x)-c$	shift the graph of $f(x)$	downward c units
$f(x+c)$	shift the graph of $f(x)$	left c units
$f(x-c)$	shift the graph of $f(x)$	right c units

Stretches and compressions

For $c > 1$,

to obtain the graph of:

$cf(x)$	stretch the graph of $f(x)$	vertically by a factor of c
$(1/c)f(x)$	compress the graph of $f(x)$	vertically by a factor of c
$f(cx)$	compress the graph of $f(x)$	horizontally by a factor of c
$f(x/c)$	stretch the graph of $f(x)$	horizontally by a factor of c

Reflections

To obtain the graph of:

$-f(x)$	reflect the graph of $f(x)$	about the x-axis
$f(-x)$	reflect the graph of $f(x)$	about the y-axis