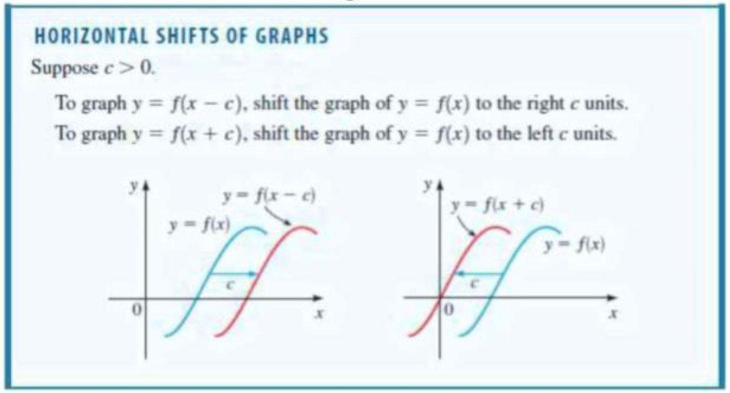
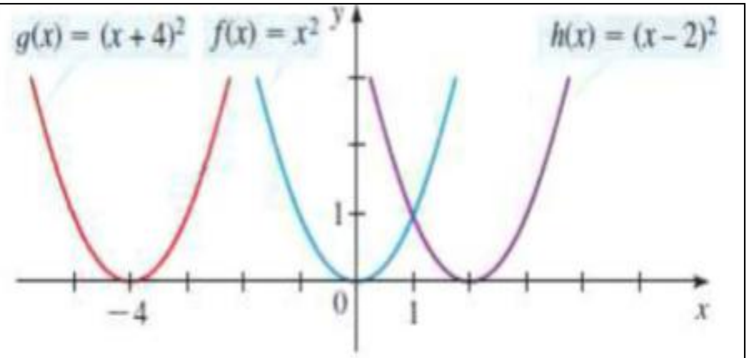
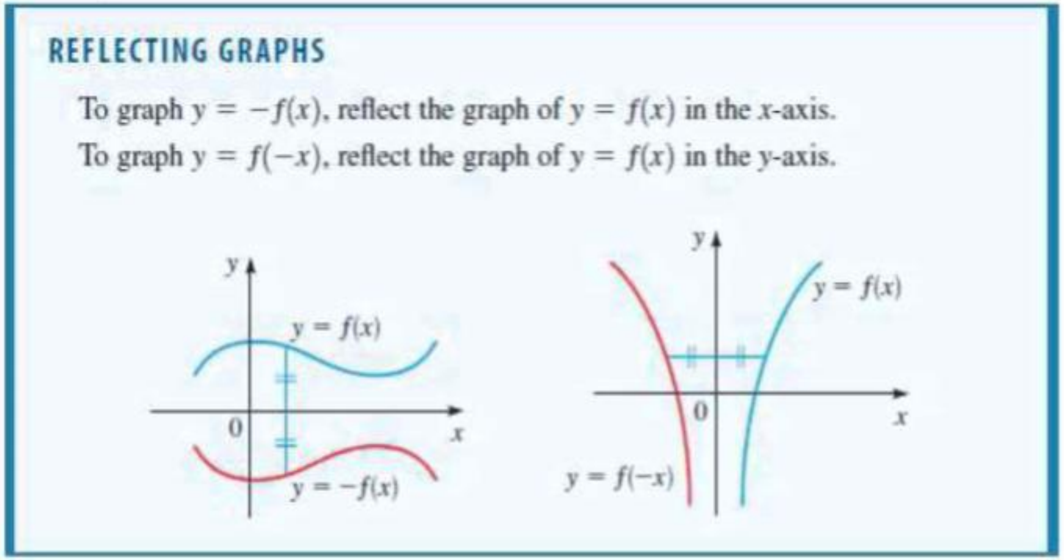
TOPIC 4.4 : TRANSFORMATION OF FUNCTIONS

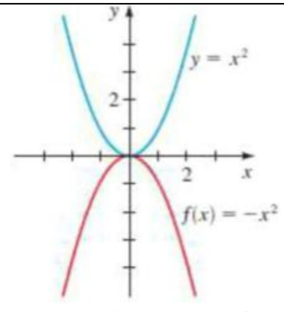
1. HORIZONTAL SHIFTS OF GRAPHS

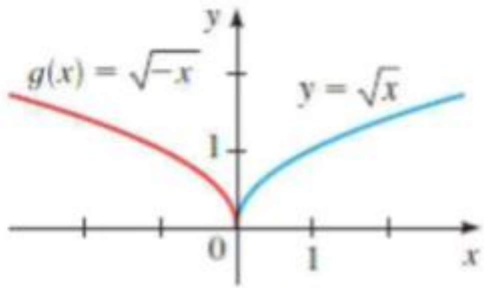




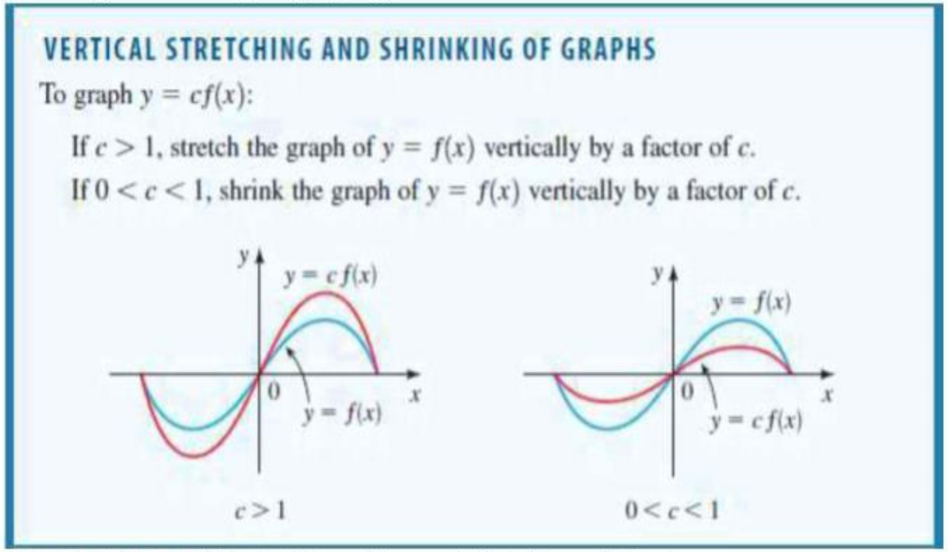
2. REFLECTING GRAPHS OF GRAPHS







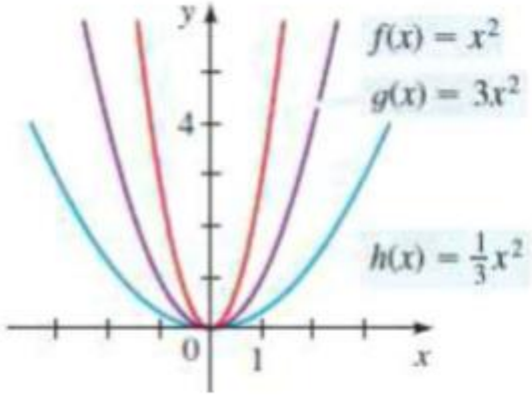
3. VERTICAL STRETCHING AND SHRINKING OF GRAPHS


VERTICAL STRETCHING AND SHRINKING OF GRAPHS

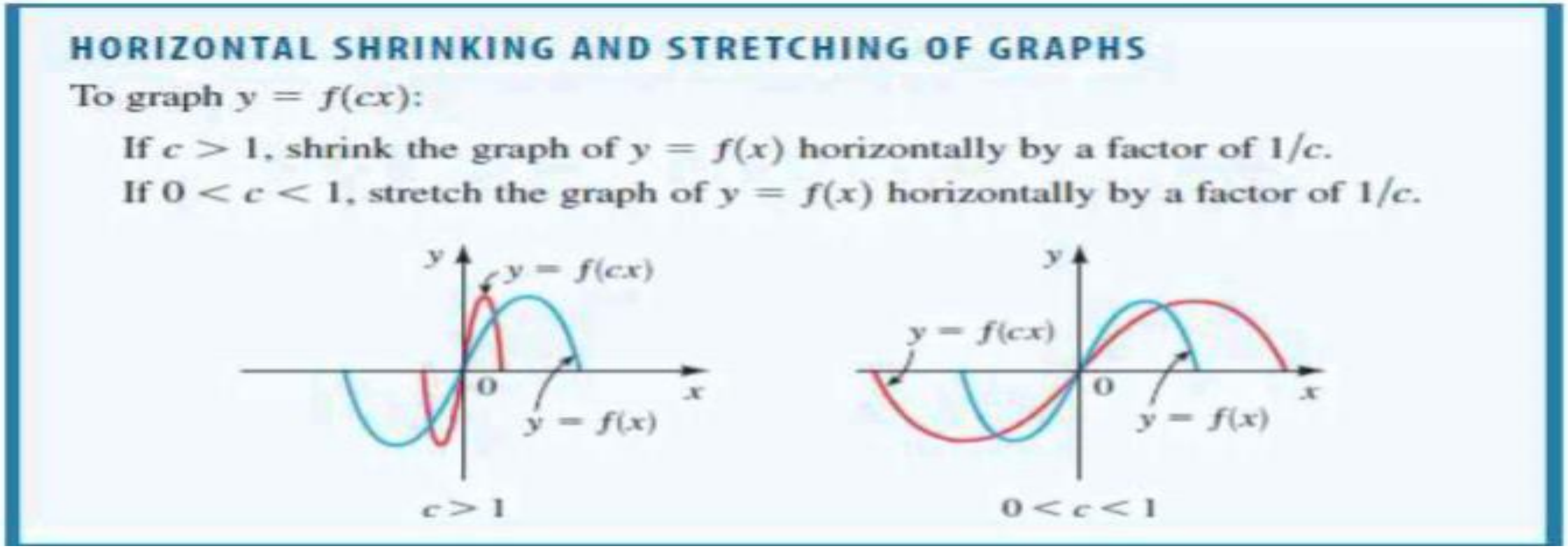
To graph $y = cf(x)$:

If $c > 1$, stretch the graph of $y = f(x)$ vertically by a factor of c.

If $0 < c < 1$, shrink the graph of $y = f(x)$ vertically by a factor of c.



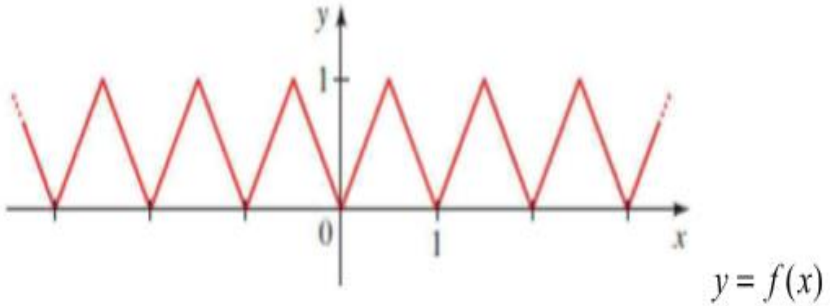
4. HORIZONTAL SHRINKING AND STRETCING OF GRAPHS

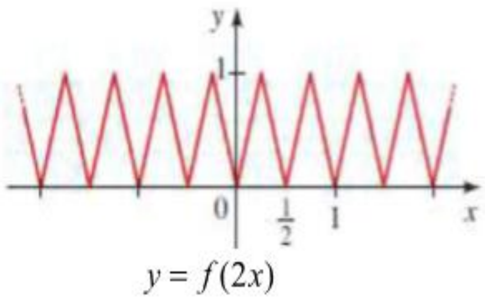

HORIZONTAL SHRINKING AND STRETCHING OF GRAPHS

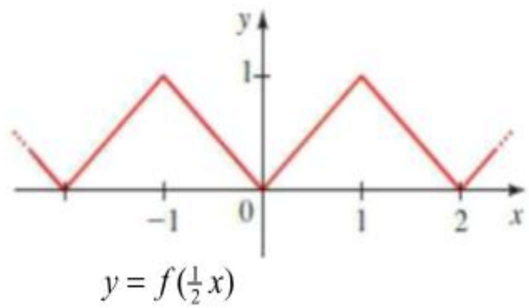
To graph $y = f(cx)$:

If $c > 1$, shrink the graph of $y = f(x)$ horizontally by a factor of $1/c$.

If $0 < c < 1$, stretch the graph of $y = f(x)$ horizontally by a factor of $1/c$.







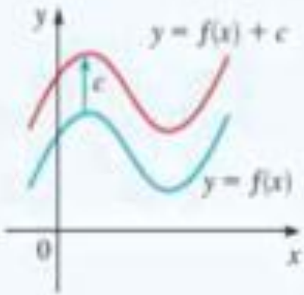
5. VERTICAL SHIFTING OF GRAPHS

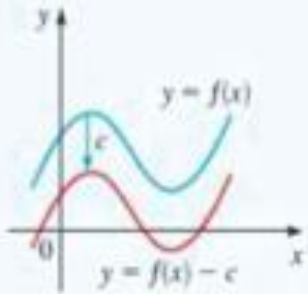
VERTICAL SHIFTS OF GRAPHS

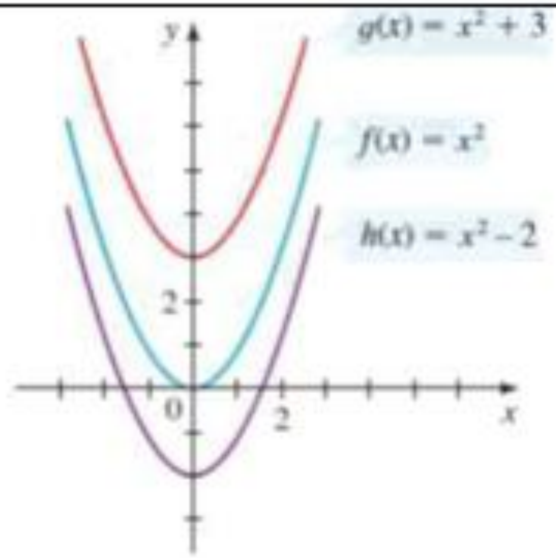
Suppose $c > 0$.

To graph $y = f(x) + c$, shift the graph of $y = f(x)$ upward c units.

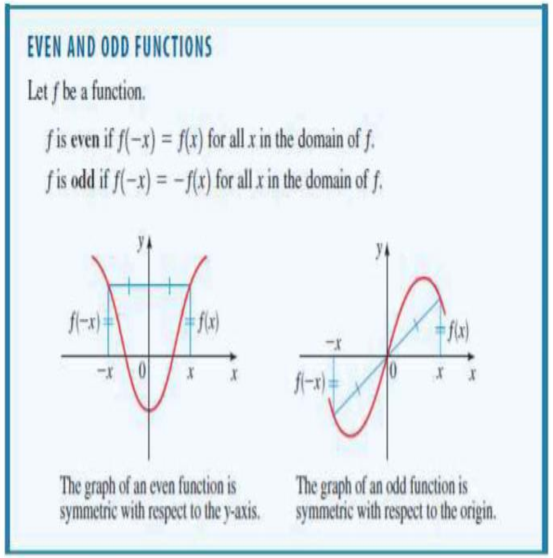
To graph $y = f(x) - c$, shift the graph of $y = f(x)$ downward c units.

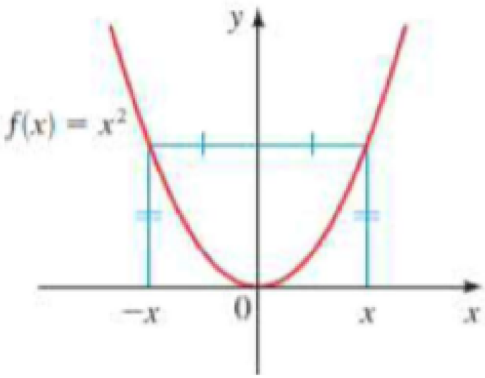
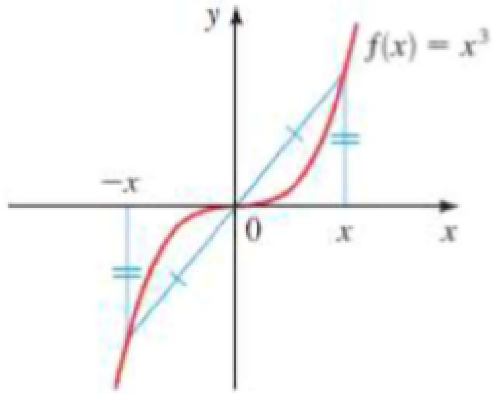






EVEN AND ODD FUNCTIONS



If a function f satisfies $f(-x)=f(x)$ for every number x in its domain, then f is called an **even function**	If f satisfies $f(-x)=-f(x)$ for every number x in its domain, then f is called an **odd function**.
For instance, the function $f(x)=x^2$ is even because $f(-x)=(-x)^2=(-1)^2(-x)^2=x^2=f(x)$  The graph of an even function is symmetric with respect to the y-axis This means that if we have plotted the graph of f for $x \geq 0$, then we can obtain the entire graph simply by reflecting this portion in the y-axis.	For example, the function $f(x)=x^2$ is odd because $f(-x)=(-x)^3=(-1)^3(-x)^3=-x^3=-f(x)$  The graph of an odd function is symmetric about the origin. If we have plotted the graph of f for $x \geq 0$, then we can obtain the entire graph by rotating this portion through 180° about the origin. (This is equivalent to reflecting first in the x-axis and then in the y-axis.)