Transformations of Graphs

If you have already sketched the graph of $y = f(x)$ then,

1) to sketch $y = f(x+a)$, you should shift (translate) the graph of $y = f(x)$ by 'a' units in the negative x direction.

2) to sketch $y = f(x - a)$, you should shift (translate) the graph of $y = f(x)$ by 'a' units in the positive x direction.

3) to sketch $y = f(x) + a$, you should shift (translate) the graph of $y = f(x)$ by 'a' units in the positive y direction.

4) to sketch $y = f(x) - a$, you should shift (translate) the graph of $y = f(x)$ by 'a' units in the negative y direction.

5) to sketch $y = af(x)$, you should stretch the graph of $y = f(x)$ by a scale factor of 'a' parallel to the y axis.

   [To do this easily, you multiply all the *y*-coordinates by '*a*' and keep the *x*-coordinates the same.]

6) to sketch $y = f(ax)$, you should stretch the graph of $y = f(x)$ by a scale factor of $\frac{1}{a}$ parallel to the x axis.

   [To do this easily, you multiply all the *x*-coordinates by $\frac{1}{a}$ and keep the y-coordinates the same.]

7) to sketch $y = -f(x)$, you should reflect the graph of $y = f(x)$ in the x axis.

8) to sketch $y = f(-x)$, you should reflect the graph of $y = f(x)$ in the y axis.