

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.