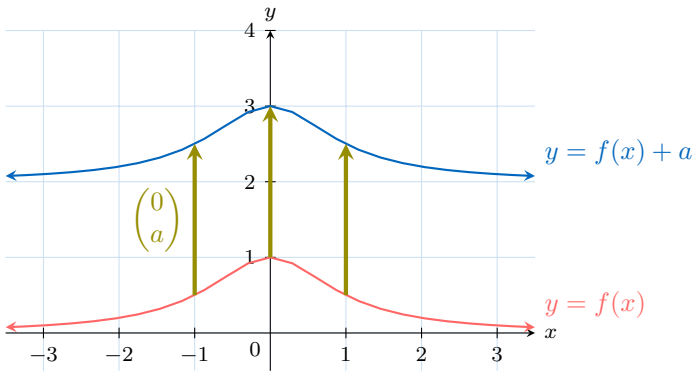
FUNCTION TRANSFORMATIONS

Function transformations allow us to modify the graph of a parent function to create new functions without starting from scratch.
By applying translations, dilations, and reflections, we can shift, stretch, compress, or flip the graph in various ways. These transformations are essential in understanding how changes to a function's equation affect its graphical representation and are widely used in modeling real-world phenomena. In this chapter, we will explore vertical and horizontal translations, dilations, and reflections, using examples and graphical illustrations to demonstrate each concept.

A TRANSLATION

Proposition Vertical Translation by Adding a Constant

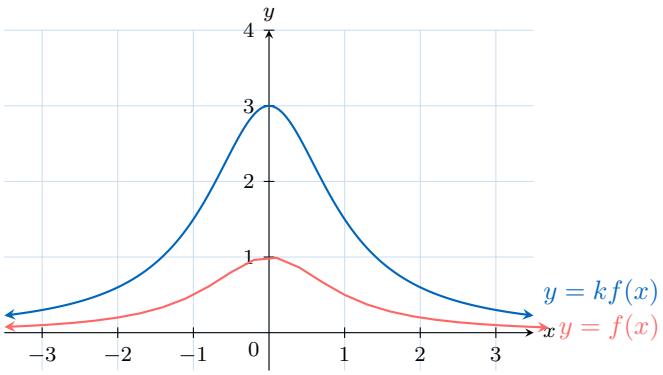
The graph of $x \mapsto f(x) + a$ is obtained by translating the graph of $x \mapsto f(x)$ by the vector $\begin{pmatrix} 0 \\ a \end{pmatrix}$



B DILATION

Proposition Dilation

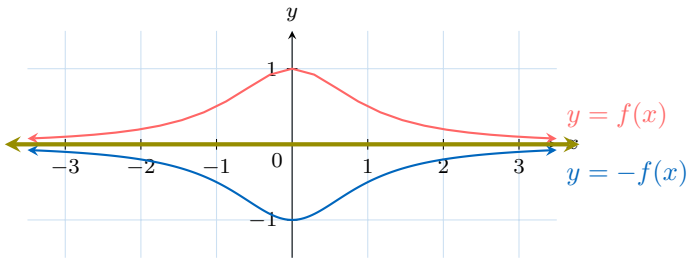
The graph of $x \mapsto kf(x)$ is obtained by dilating the graph of $x \mapsto f(x)$ by the factor k.



C REFLECTION

Proposition Reflection over the x-axis

The graph of $x \mapsto -f(x)$ is obtained by reflecting the graph of $x \mapsto f(x)$ over the x-axis.



Proposition **Reflection over the y-axis**

The graph of $x \mapsto f(-x)$ is obtained by reflecting the graph of $x \mapsto f(x)$ over the y-axis.