

Notes Regarding Linear Transformations

Summary of Transformations

Translations -

$$x \rightarrow x - a \quad \begin{array}{ll} a > 0 & \rightarrow \\ a < 0 & \leftarrow \end{array}$$

$$y \rightarrow y - b \quad \begin{array}{ll} b > 0 & \uparrow \\ b < 0 & \downarrow \end{array}$$

Stretch/Shrinks -

Amplitude Shifting $y \rightarrow \frac{y}{c}$

$$\begin{array}{ll} |c| > 1 & \updownarrow \\ |c| < 1 & \updownarrow \\ c < 0 & \updownarrow \end{array}$$

Frequency Shifting $x \rightarrow \frac{x}{d}$

$$\begin{array}{ll} |d| > 1 & \leftarrow \rightarrow \\ |d| < 1 & \leftarrow \rightarrow \\ d < 0 & \leftarrow \rightarrow \end{array}$$

$$y = f(x)$$

$$x \rightarrow x - 4$$

$$x_{\text{old}} = x_{\text{new}} - 4$$

$$x_{\text{new}} = x_{\text{old}} + 4$$

$$\therefore y = f(x - 4)$$

is $y = f(x)$ translated 4 to the right.

$$y = f(x)$$

$$y \rightarrow \frac{y}{-\frac{2}{3}}$$

$$y_0 = \frac{y_n}{-\frac{2}{3}}$$

$$y_n = -\frac{2}{3} y_0$$

$$\text{so, } \frac{y}{-\frac{2}{3}} = f(x)$$

$$\Rightarrow y = -\frac{2}{3} f(x)$$

$\therefore$ this fcn. is $y = f(x)$
 $\frac{2}{3}$ as tall and upside down