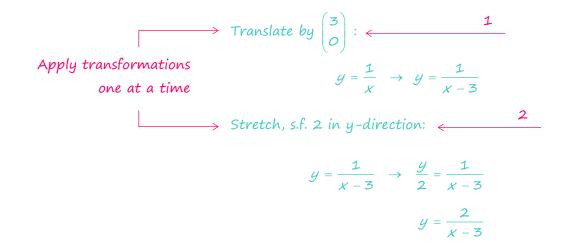


**2.2e**. The graph  $y = \frac{1}{x}$  is translated by  $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ , followed by a stretch of scale factor of 2 in the y-direction.

Find the equation of the transformed graph.



**2.2p.** The graph  $y = \sin x$  is translated by 2 units in the negative y-direction and stretched by a scale factor of 3 in the x-direction.

Find the equation of the transformed graph.



**2.3e**. Describe a sequence of transformations which maps the graph of  $y = e^x$  onto the graph  $y = e^{2x} + 5$ .

Translation  $\begin{pmatrix} 0\\ 5 \end{pmatrix}$ :  $y = e^x \rightarrow y - 5 = e^x$   $y = e^x + 5$ Stretch, s.f.  $\frac{1}{2}$  parallel to the x-axis:  $y = e^x - 5 \rightarrow y = e^{2x} - 5$  **2.3p.** Describe a sequence of transformations which maps the graph of  $y = \ln x$  onto the graph  $y = 3\ln(x+4)$ .

**2.5e**. A graph has equation  $y = x^3$ . Find the equation of the graph after the following transformations:

(a) A translation of  $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ , followed by a stretch parallel to the *y*-axis with scale factor 4.

- (b) A stretch parallel to the y-axis with scale factor 4, followed by a translation of  $\begin{pmatrix} 3\\0 \end{pmatrix}$ .
- (a) Translation  $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ :
  - $\mathcal{Y} = \mathbf{X}^3 \rightarrow \mathcal{Y} = (\mathbf{X} \mathbf{3})^3$

Horizontal stretch, s.f. 4:

$$\mathcal{G} = (\mathcal{X} - \mathcal{Z})^3 \quad \Rightarrow \quad \mathcal{G} = \left(\frac{1}{4}\mathcal{X} - \mathcal{Z}\right)^3$$

(b) Horizontal stretch, s.f. 4:

 $y = x^{3} \rightarrow y = \left(\frac{1}{4}x\right)^{3}$ Translation  $\begin{pmatrix} 3\\0 \end{pmatrix}$ :  $y = \left(\frac{1}{4}x\right)^{3} \rightarrow y = \left(\frac{1}{4}(x-3)\right)^{3}$ 

 $\mathcal{Y} = \left(\frac{1}{4} \times -\frac{4}{3}\right)$ 

- **2.5p**. A graph has equation  $y = 2^x$ . Find the equation of the graph after the following transformations:
- (a) A vertical stretch with scale factor 5, following by a translation of  $\begin{pmatrix} 0\\-1 \end{pmatrix}$ .
- (b) A translation of  $\begin{pmatrix} 0 \\ -1 \end{pmatrix}$ , followed by a vertical stretch with scale factor 5.