

Graphs – Q10 [Practice/M](20/6/21)

Describe the transformation represented by $y = e^x \rightarrow y = e^{4-x}$

Solution

Step 1: Replace x with $-x$ (reflection in y -axis), to give $y = e^{-x}$

Step 2: Replace x with $x - 4$ (translation of $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$), to give

$$y = e^{-(x-4)} = e^{4-x}$$

So the transformation is a reflection in the y -axis, followed by a translation of $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$. This enables the graph to be sketched.

However, this compound transformation can be represented as a single transformation: in general, a reflection in the line $x = L$ is achieved by replacing x with $2L - x$, so that in this case we have a reflection in the line $x = 2$. [Consider the statement $\sin(\pi - \theta) = \sin\theta$, which arises because of the symmetry of the sine curve about $\theta = \frac{\pi}{2}$.]