

In this section, we shall examine how to graph $y = \cos^2 x$ and $y = \sin^2 x$ **without the use of the graphic calculator.**

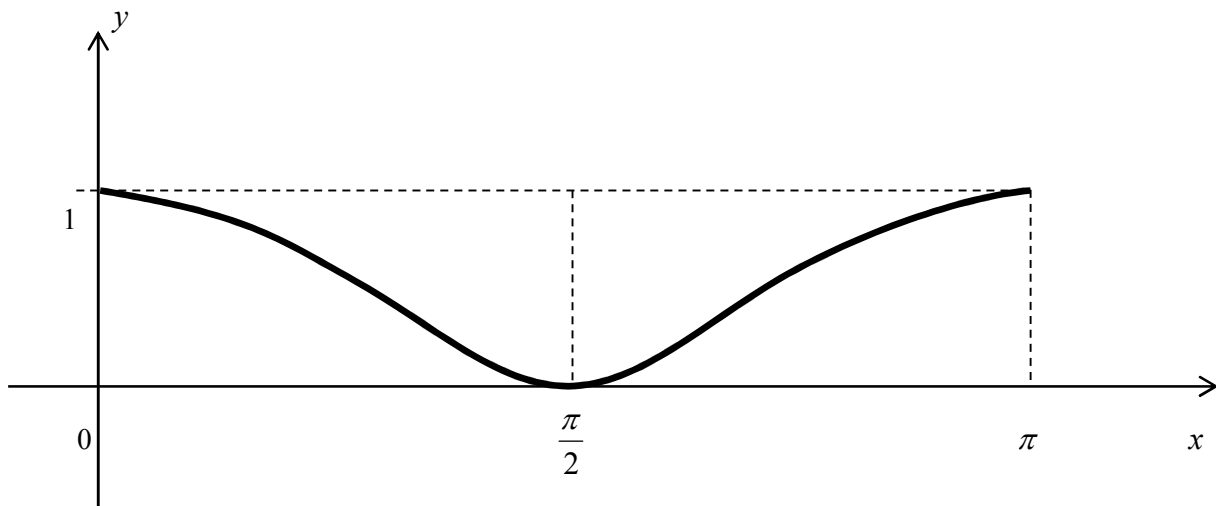
$$y = \cos^2 x$$

By the double angle formula, $\cos 2x = 2 \cos^2 x - 1 \Rightarrow \cos^2 x = \frac{1 + \cos 2x}{2} = \frac{1}{2} + \frac{1}{2} \cos 2x$

Beginning with the graph of $y = \cos x$, we shall **perform transformations in the following order:**

- (i) Scaling parallel to the x – axis by a factor of $\frac{1}{2}$. (Also equivalent to doubling the frequency)
- (ii) Scaling parallel to the y – axis by a factor of $\frac{1}{2}$.
- (iii) Translation parallel to the y – axis by $\frac{1}{2}$ unit vertically upwards.

The graph of $y = \cos^2 x$ is therefore given below:



$$y = \sin^2 x$$

Using the identity $\cos^2 x + \sin^2 x = 1 \Rightarrow \sin^2 x = 1 - \cos^2 x$, we can **perform the following transformations** on the graph of $y = \cos^2 x$ to obtain the graph of $y = \sin^2 x$:

- (i) Reflection in the x -axis. (Also equivalent to scaling parallel to the y -axis by a factor of -1 .)
- (ii) Translation parallel to the y -axis by 1 unit vertically upwards.

The graph of $y = \sin^2 x$ is therefore given below:

