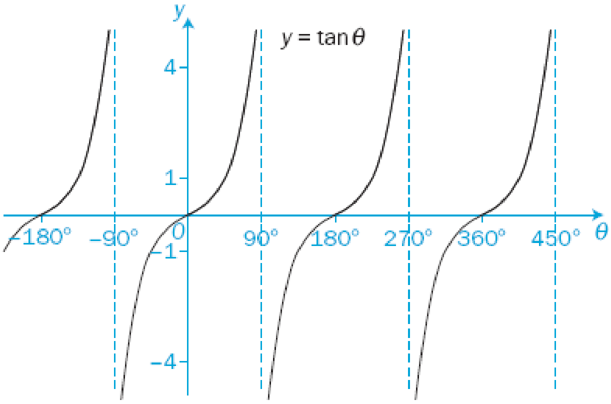
TRIGONOMETRIC FUNCTIONS

You can also draw a graph of $y = \tan\theta$.

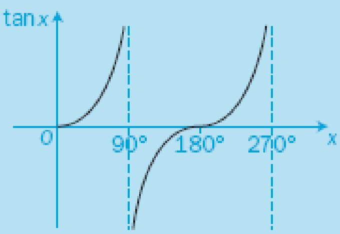


You can extend this graph in both the positive and negative directions to show the value of tan x for any x.

The lines, $\theta = -90°, 90°, 270°\ldots$, are asymptotes to the curve. $y = \tan\theta$ approaches but never meets them.

- You can calculate some values for the tangent ratio:

  $\tan 0° = 0$
  $\tan 180° = 0$
  $\tan 360° = 0$



The graph of tan θ has asymptotes at $\theta = 90°$ and $\theta = 270°$

What happens when you try to input tan 90° and tan 270° into your calculator? Do any other values give this result?

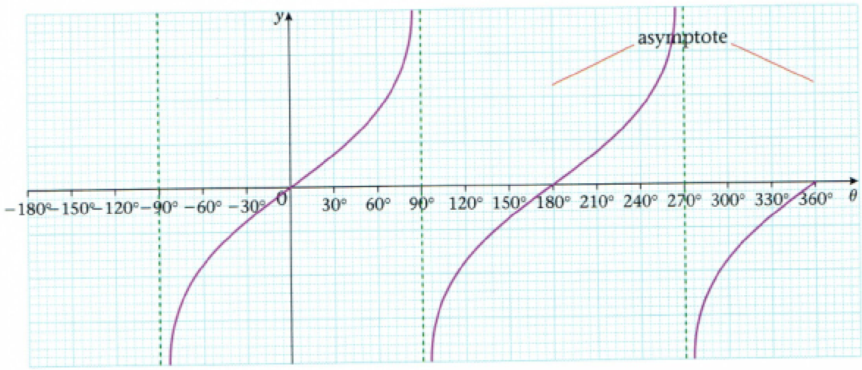
- The tangent function is periodic.
  It has a period of 180° or π radians.
  $\tan(\theta + 180°) = \tan\theta$ and $\tan(\theta - 180°) = \tan\theta$

- The tangent curve has asymptotes at $(2n + 1)90°$ where n is an integer.

e.g. There is an asymptote at $\theta = (2 \times 2 + 1) \times 90°$
$= 5 \times 90° = 450°$

You can see from the graph that the curve approaches the asymptotes but never reaches them.
You can show this by writing $\tan\theta \to \pm\infty$ for these values.

$y = \tan\theta$



This function behaves very differently from the sine and cosine functions but it is still periodic, it repeats itself in cycles of 180° so its period is 180°.

The period symmetry properties of $\tan\theta$ are

$\tan(\theta + 180°) = \tan\theta$

$\tan(\theta - 180°) = \tan\theta$

Hint: The dotted lines on the graph are called asymptotes, lines to which the curve approaches but never reaches; these occur at $\theta = (2n + 1)90°$ where n is integer.