2 Unit Bridging Course – Day 10

Circular Functions I – The sine function

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THE UNIVERSITY OF SYDNEY

Radians mode

We're going to study two new functions called sin and cos.

You can calculate various values of these functions using the `sin` and `cos` buttons on your calculator, providing you remember:

Radians

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Values of sin and cos

For example, use your calculator to find the following values of the sin and cos functions:

$$\begin{aligned}
\sin(0) &= 0 \\
\sin(\pi) &= 0 \\
\sin(\pi/2) &= 1 \\
\cos(0) &= 1 \\
\cos(\pi) &= -1 \\
\cos(\pi/2) &= 0.
\end{aligned}$$

Let's start by studying sin in more detail.

The sine function is abbreviated to sin, but is still pronounced "sine".

The most important property of the sin function is that it is periodic.

This means that the graph of $y = \sin(x)$ repeats itself after a certain x-value is passed.

Check by using your calculator that

$$\sin(-2\pi) = \sin(0) = \sin(2\pi) = \sin(4\pi).$$

Indeed, the graph of $y = \sin(x)$ repeats itself every 2π.

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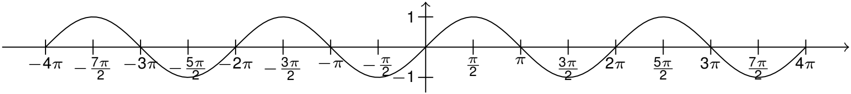
Graph of $y = \sin(x)$

Below is the graph of $y = \sin(x)$ between $x = -4\pi$ and $x = 4\pi$.



The graph continues forever in both directions.

Properties of sine

We can read all of the following important properties off the graph of $y = \sin(x)$:

(i) $-1 \leq \sin x \leq 1$ for all x.

$\sin(x)$ never goes above 1 or below -1. We say that 1 is the amplitude of the function.

(ii) $\sin(x + 2\pi) = \sin x$ for all x.

The function repeats itself every 2π – the value of the function 2π units further along the x-axis from some point a is the same as the value at a. We say the function is periodic with period 2π.

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(iii) $\sin(-x) = -\sin(x)$ for all x.

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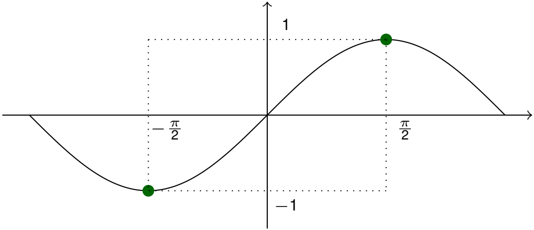

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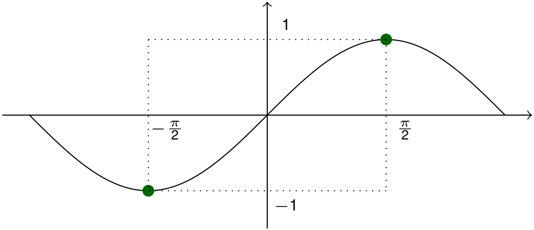

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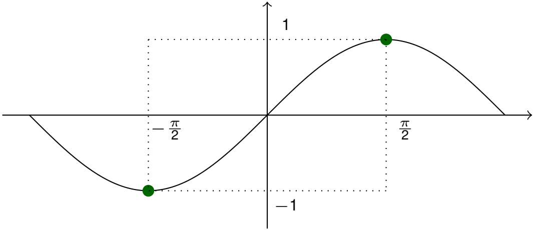

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