Lesson 4 – The Derivatives of Sine and Cosine Functions

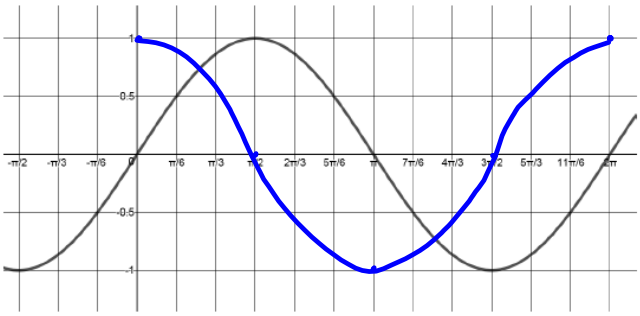
PART A: Looking for the Derivative of the Sine function

1. The graph of $f(x) = sin(x)$ is shown.

   a) Complete the following chart for f(x) (correct to 3 decimal places).

   b) Complete the chart for f'(x) by estimating the slope of the tangent at key points, or by using the graphing calculator.

   c) Sketch the derivative of $f(x) = sin(x)$ on the graph.



	A	B	C	D	E	F	G	H	I	J	K	L	M
***x* (radians)**	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
***f* (*x*)**	0	0.5	0.866	1	0.866	0.5	0	-0.5	-0.866	-1	-0.866	-0.5	0
***f*′ (*x*)**	1	0.866	0.5	0	-0.5	-0.866	-1	-0.866	-0.5	0	0.5	0.866	1

d) How does the graph of $f'(x)$ compare to the graph of $f(x)$? Describe all similarities and differences that you observe.

- f '(x) looks like cosine
- graphs are separated by $\frac{\pi}{2}$ units (sinx translated $\frac{\pi}{2}$ units right)

e) What is the derivative of $f(x) = sin(x)$?

$$f'(x) = \cos x$$

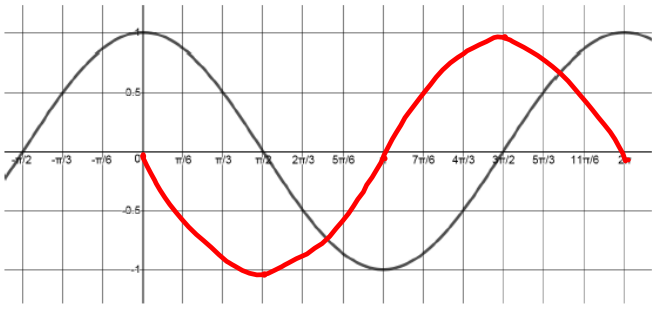
PART B: Looking for the derivative of the Cosine function

2. The graph of $f(x) = cos(x)$ is shown.

   a) Complete the following chart for $f(x)$ (correct to 3 decimal places).

   b) Complete the chart for $f'(x)$ by estimating the slope of the tangent at key points, or by using the graphing calculator.

   c) Sketch the derivative of $f(x) = sin(x)$ on the graph.



	A	B	C	D	E	F	G	H	I	J	K	L	M
***x* (radians)**	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
***f* (*x*)**	1	0.866	0.5	0	-0.5	-0.866	-1	-0.866	-0.5	0	0.5	0.866	1
***f*′ (*x*)**	0	-0.5	-0.866	-1	-0.866	-0.5	0	0.5	0.866	1	0.866	0.5	0

d) How does the graph of $f'(x)$ compare to the graph of $f(x)$? Describe all similarities and differences that you observe.

- *f ' (x)* looks like reflected sin*x*

e) What is the derivative of $f(x) = cos(x)$?

$$f'(x) = -\sin x$$

Key Concepts

The derivative of $sinx$ is cosx

The derivative of $cosx$ is -sinx