MCV4U Date _____

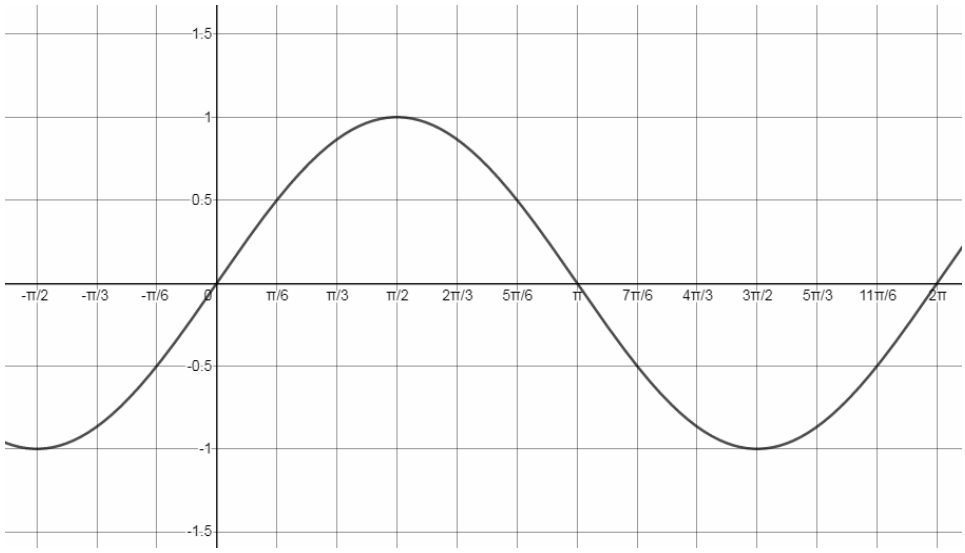
Derivatives of Functions - Day 2: Exploring the derivatives of sine and cosine

The slope of the tangent to a curve at a point is defined to be the derivative. By calculating the derivative of a curve at many points, a new function can be obtained. By finding the equation that will fit the points, the derivative of $f(x)=\sin x$ and $f(x)=\cos x$ can be discovered.

1) The graph of $f(x)=\sin x$ is shown on the right.

a) Complete the chart below (to 2 decimal places) for the row of $f'(x)$ by entering $f(x)=\sin x$ into DESMOS and then using the $f'(x)$ notiation and evaluating $f'(x)$ for each value of x.

b) Draw the scatter plot in the grid on the right and determine $f'(x)$.



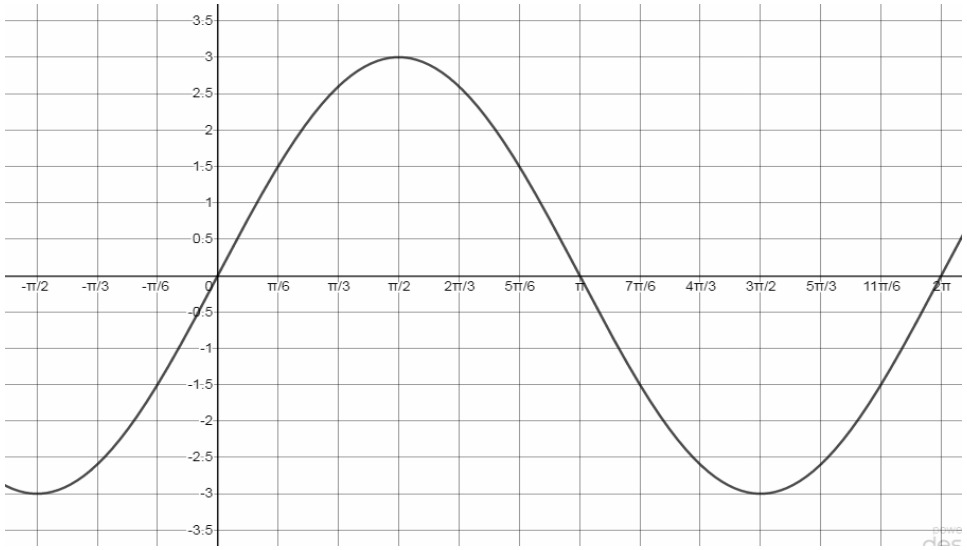
$f'(x)=$ _____

	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
$f'(x)$													

2) The graph of $f(x)=3\sin x$ is shown on the right.

a) Complete the chart below (to 3 decimal places) for the row of $f'(x)$ by entering $f(x)=3\sin x$ into DESMOS and then using the $f'(x)$ notiation and evaluating $f'(x)$ for each value of x.

b) Draw the scatter plot in the grid on the right and determine $f'(x)$.



$f'(x)=$ _____

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$f'(x)$													

Practice to be completed for homework	Answers
1) Determine and interpret $f\left(\frac{3\pi}{4}\right)$ and $f'\left(\frac{3\pi}{4}\right)$ for $f(x)=\sin x$. (*x* is in radians!)	$f\left(\frac{3\pi}{4}\right)=\frac{\sqrt{2}}{2}$, $f'\left(\frac{3\pi}{4}\right)=-\frac{\sqrt{2}}{2}$
2) An object moves so that at *t* seconds its position *s*, in meters, is found using $s(t)=5\cdot\cos t$. a) For what values of *t* does the object change direction? b) What is its maximum velocity?	a) every π seconds, starting at 0 seconds b) 5m/s
3) Are there any values of *x*, $0\le x\le 2\pi$, for which tangent lines to $f(x)=\sin x$ and $g(x)=\cos x$ are parallel? If so, find the values.	$\frac{3\pi}{4},\frac{7\pi}{4}$
4) Find the instantaneous rate of change of $y=\sin x$ at $x=\frac{7\pi}{6}$.	$-\frac{\sqrt{3}}{2}$
5) Find the equation of the tangent to $y=\cos x$ at $x=\frac{\pi}{2}$.	$y=-x+\frac{\pi}{2}$
6) Find the slope of the tangent to the curve $y=3\cos x$ at $x=\frac{5\pi}{6}$.	$-\frac{3}{2}$