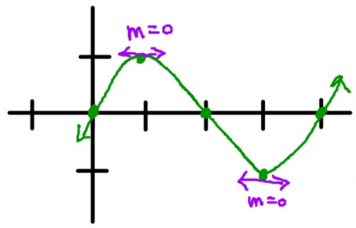
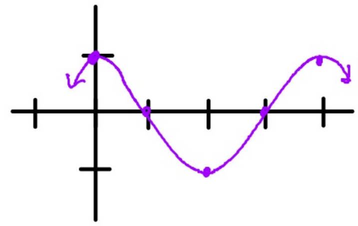
Section 3.5 Derivatives of Trig Functions

1) $f(x) = \sin x$

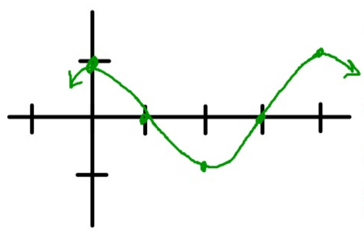


x	$f'(x)$
0	1
$\pi/2$	0
π	-1
$3\pi/2$	0
2π	1

$f'(x) = \cos x$

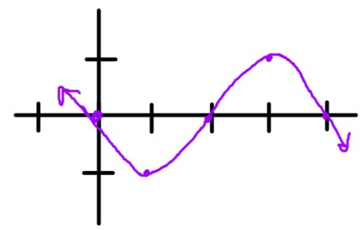


2) $f(x) = \cos x$



x	$f'(x)$
0	0
$\pi/2$	-1
π	0
$3\pi/2$	1
2π	0

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



3) $f(x) = \tan x$

$f(x) = \frac{\sin x}{\cos x}$

$f'(x) = \frac{\cos x(\cos x) - \sin x(-\sin x)}{(\cos x)^2}$

$f'(x) = \frac{\cos^2 x + \sin^2 x}{\cos^2 x}$

$f'(x) = \frac{1}{\cos^2 x}$

$f'(x) = \sec^2 x$

4) $f(x) = \cot x$

$f(x) = \frac{\cos x}{\sin x}$

$f'(x) = \frac{\sin x(-\sin x) - \cos x(\cos x)}{\sin^2 x}$

$f'(x) = \frac{-\sin^2 x - \cos^2 x}{\sin^2 x}$

$f'(x) = \frac{-1}{\sin^2 x}$

$f'(x) = -\csc^2 x$

$f(x)$	$f'(x)$
$\sin x$	$\cos x$
$\cos x$	$-\sin x$
$\tan x$	$\sec^2 x$
$\cot x$	$-\csc^2 x$
$\csc x$	$-\cot x \csc x$
$\sec x$	$\tan x \sec x$

5) $f(x) = \csc x$

$f(x) = \frac{1}{\sin x}$

$f'(x) = \frac{\sin x(0) - (1)\cos x}{\sin^2 x}$

$f'(x) = \frac{-\cos x}{\sin x \cdot \sin x}$

$f'(x) = -\cot x \cdot \csc x$

<u>Review</u>

a) $y = x^5$

$y' = 5x^4$

b) $y = 3x^4$

$y' = 12x^3$

6) $y = 3\sin x$

$y' = 3\cos x$

7) $y = 3\csc x$

$y' = -3\cot x\csc x$

8) $y = x^2 \cdot \sin x$

$y' = x^2 \cdot \cos x + \sin x \cdot 2x$

$y' = x^2\cos x + 2x\sin x$

9) $y = 3\cos x + \pi x$

$y' = -3\sin x + \pi$

10) Given $f(x) = x\csc x$

Find the line tangent at $x = \frac{\pi}{2}$

pt.

$\left(\frac{\pi}{2}, f\left(\frac{\pi}{2}\right)\right)$

$f\left(\frac{\pi}{2}\right) = \frac{\pi}{2} \cdot \csc\left(\frac{\pi}{2}\right)$

$= \frac{\pi}{2} \cdot (1)$

$= \frac{\pi}{2}$

$\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$

slope

$f'(x) = x \cdot (-\cot x \cdot \csc x) + \csc x \cdot (1)$

$f'(x) = -x\cot x \cdot \csc x + \csc x$

$f'(\pi/2) = -\frac{\pi}{2} \cdot \cot\left(\frac{\pi}{2}\right) \cdot \csc\left(\frac{\pi}{2}\right) + \csc(\pi/2)$

$f'(\pi/2) = -\frac{\pi}{2}(0) \cdot (1) + 1$ $\quad \cot\frac{\pi}{2} = \frac{0}{1} = 0$

$f'(\pi/2) = 1$

$$y - \frac{\pi}{2} = 1\left(x - \frac{\pi}{2}\right)$$