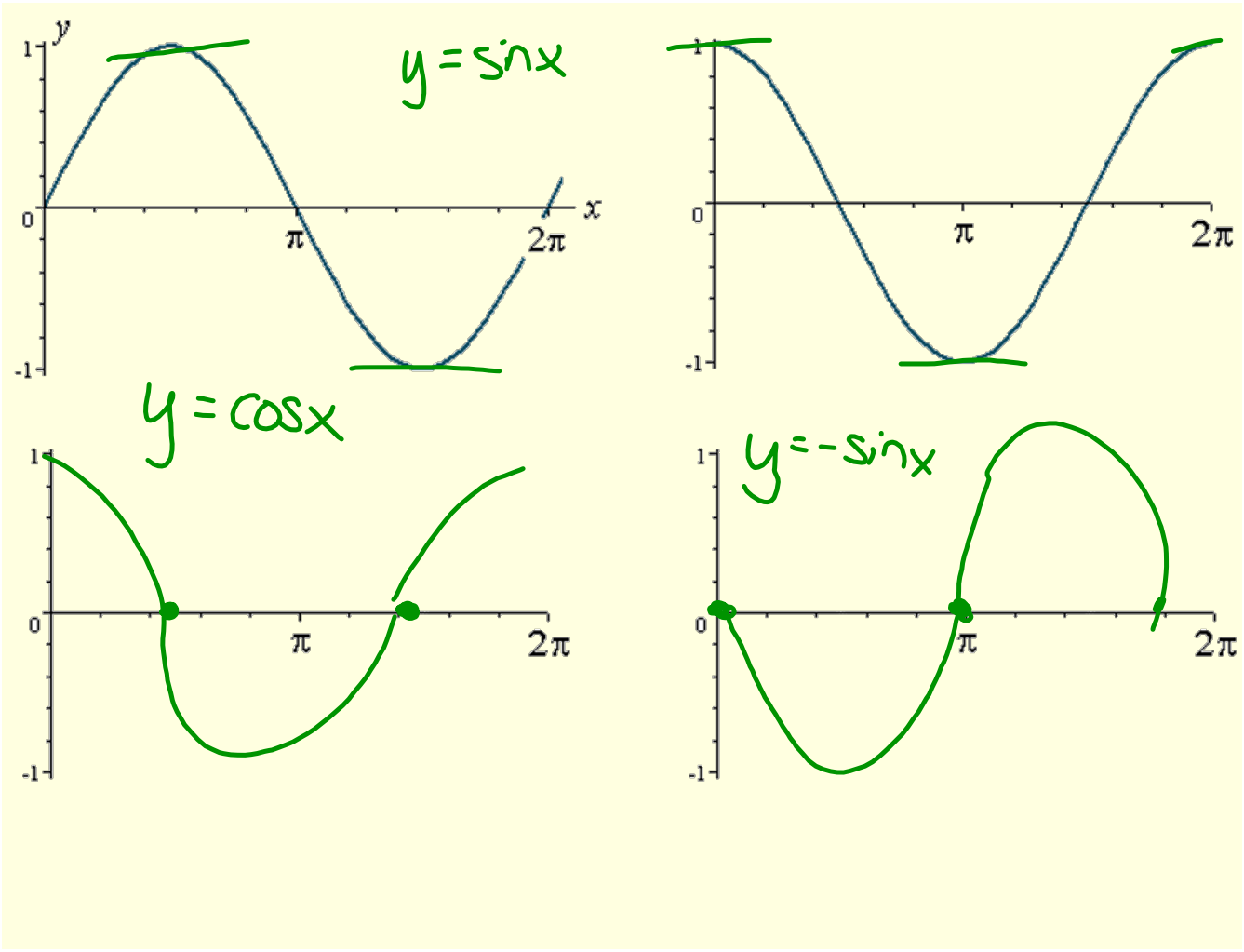
Calculus Unit #1

14.1 Derivatives of Trig Functions


y = sinx
y = cosx
y = -sinx
y
x
1
0
-1
π
2π

$\frac{d}{dx}\sin x = \cos x$

$\frac{d}{dx}\cos x = -\sin x$

Function	*Derivative*
$y = 2\sin x$	$y' = 2\cos x$
$y = \frac{\sin x}{2} = \frac{1}{2}\sin x$	$y' = \frac{1}{2}\cos x$
$y = x + \cos x$	$y' = 1 - \sin x$

Find the equation of the tangent line to the curve $f(x) = \cos 3x$ when $x = \frac{\pi}{9}$.

$f'(x) = -3\sin 3x$

$f'\left(\frac{\pi}{9}\right) = -3\sin\left(3\frac{\pi}{9}\right)$

$F(u) = \cos u$

$u = 3x$

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

$u' = 3$

How can we find the derivative of the tangent?

$f'\left(\frac{\pi}{9}\right) = -3\sin\left(\frac{\pi}{3}\right)$

$m = -3\left(\frac{\sqrt{3}}{2}\right)$

pt: $\left(\frac{\pi}{9}, \frac{1}{2}\right)$

$y - \frac{1}{2} = -\frac{3\sqrt{3}}{2}\left(x - \frac{\pi}{9}\right)$

$f''(x)$

$= -3(3\cos 3x)$

$= -9\cos 3x$

Differentiate these composite trigonometric functions:

1. $y = \sin(2x + 5)$
2. $f(x) = \cos(1 - x^2)$
3. $y = \tan^2 x$
4. $y = \sin x \cos x$
5. $f(x) = \frac{4}{x^2}\sin x$
6. $y = \frac{x}{\sin x}$
7. $g(t) = \frac{\cos t}{t+1}$
8. $f(t) = \sin^3 4t$

① $y = \sin(2x+5)$

$f(u) = \sin u \quad f'(u) = \cos u$

$u = 2x+5 \quad u' = 2$

$y' = 2\cos(2x+5)$

⑧ $f(t) = (\sin 4t)^3$

$f(u) = u^3 \quad f'(u) = 3u^2$

$u = \sin 4t \quad u' = 4\cos 4t$

$f'(t) = 3\sin^2 4t(4\cos 4t)$

$= 12\sin^2 4t\cos 4t$

Homework:

page 498 (1-12 even)

page 499 (2 and 4)