AP Calculus AB - Worksheet 34 **Derivatives of sine and cosine functions.**

Know the following theorems:

$\dfrac{d}{dx}\sin\square=\cos\square\cdot\dfrac{d\square}{dx}$	and	$\dfrac{d}{dx}\cos\square=-\sin\square\cdot\dfrac{d\square}{dx}$

Examples

1. $y=\sin 5x$ $y=\sin\boxed{5x}$ $y'=\cos\boxed{5x}\cdot d\boxed{5x}$ $y'=5\cos\boxed{5x}$	2. $y=\cos 9x$ $y=\cos\boxed{9x}$ $y'=-\sin\boxed{9x}\cdot d\boxed{9x}$ $y'=-9\sin\boxed{9x}$	3. $y=3\sin^4 x$ $y=3\boxed{\sin\boxed{x}}^4$ $y'=3\cdot 4\boxed{\sin\boxed{x}}^3\cdot d\boxed{\sin\boxed{x}}$ $y'=12\boxed{\sin\boxed{x}}^3\cdot\cos\boxed{x}\cdot d\boxed{x}$ $y'=12\sin^3 x\cos x$

Find the derivative of each function. Simplify, if necessary.

1	$y=\sin\left(3x^2-4x\right)$
2	$y=-5\cos\left(x^3\right)$
3	$f(x)=\cos^2 x$
4	$y=\sin x\cos x$
5	$y=2x\cos x$
6	$f(x)=\dfrac{1}{x}+5\sin x$
7	$y=\dfrac{x}{\cos x}$
8	$f(x)=\dfrac{\cos x}{1+\sin x}$
9	$y=(1+\cos 2x)^3$

10	Find the equation for the line that is tangent to $f(x)=\sin(x)+3$ at $x=\dfrac{\pi}{6}$.
11	Find the equation of the normal line to $f(x)=\sin x+\cos x$ at $x=\pi$.
12	Determine all values of x in the interval $(0,2\pi)$ for which $f(x)=\cos x$ has horizontal tangents.

Answers

1) $y'=(6x-4)\cos\left(3x^2-4x\right)$	2) $\dfrac{dy}{dx}=15x^2\sin\left(x^3\right)$	3) $f'(x)=-2\cos x\sin x$
4) $y'=\cos 2x$ (common identity)	5) $y'=2(\cos x-x\sin x)$	6) $f'(x)=-\dfrac{1}{x^2}+5\cos x$
7) $y'=\dfrac{\cos x+x\sin x}{\cos^2 x}$	8) $f'(x)=-\dfrac{1}{1+\sin x}$	9) $\dfrac{dy}{dx}=3(1+\cos 2x)^2\cdot(-2\sin 2x)$
10) $T: y-\dfrac{7}{2}=\dfrac{\sqrt{3}}{2}\left(x-\dfrac{\pi}{6}\right)$	11) $y+1=x-\pi$	12) $x=\pi$