Name: _____ Date: _____

AP Calculus AB

Do Now:

1. Find $\frac{d^2y}{dx^2}$: $y = \cot(3x-1)$

$$\frac{dy}{dx} = -\csc^2(3x-1)\cdot 3 = -3\csc^2(3x-1)$$

$$\frac{d^2y}{dx^2} = -6\csc(3x-1)(-\cot(3x-1))\csc(3x-1)\cdot 3$$

$$\frac{d^2y}{dx^2} = +18\csc^2(3x-1)\cot(3x-1)$$

AND #s 1-5 on More Chain Rule with Trig sheet

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AP Calc AB: More Chain Rule with Trig Functions Practice Ms. Loughran

For each of the following find y'.

1. $y = 3\cot^4 x$

$y = 3(\cot x)^4$

$y' = 12\cot^3 x(-\csc^2 x)\cdot 1$

$y' = -12\cot^3 x \csc^2 x$

2. $y = \csc x^3$

$y' = (-\cot x^3)(\csc x^3)\cdot 3x^2$

$y' = -3x^2 \cot x^3 \csc x^3$

3. $y = \tan\sqrt[3]{x}$

$y = \tan x^{\frac{1}{3}}$

$y' = \sec^2 x^{\frac{1}{3}} \cdot \frac{1}{3}x^{-2/3}$

$y' = \frac{\sec^2 \sqrt[3]{x}}{3\sqrt[3]{x^2}}$

4. $y = \sqrt{x} + \frac{1}{4}\sin(2x)^2$

$y = x^{\frac{1}{2}} + \frac{1}{4}\sin(4x^2)$

$y' = \frac{1}{2}x^{-\frac{1}{2}} + \frac{1}{4}\cos(4x^2)\cdot 8x$

$y' = \frac{1}{2\sqrt{x}} + 2x\cos(4x^2)$

5. $y = \tan^4(x^3)$

$y' = 4\tan^3(x^3)\cdot\sec^2(x^3)\cdot 3x^2$

$y' = 12x^2\tan^3(x^3)\sec^2(x^3)$

6. $y = \sqrt{3x - \sin^2(4x)}$

$y = (3x - \sin^2(4x))^{\frac{1}{2}}$

$y' = \frac{1}{2}(3x - \sin^2(4x))^{-\frac{1}{2}} \cdot (3 - \overbrace{2\sin(4x)\cos(4x)}^{\sin 8x,\ \sin 2(4x),\ \sin 2A} \cdot 4)$

$y' = \frac{3 - 4\sin 8x}{2\sqrt{3x - \sin^2(4x)}}$

7. Given $y = \sin(3x^2)$. Find $\frac{d^2y}{dx^2}$.

$\frac{dy}{dx} = \cos(\overset{f}{3x^2}) \cdot \overset{g}{6x}$ ← need product rule here

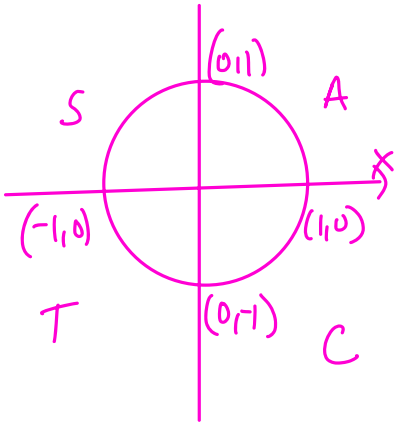
$\frac{d^2y}{dx^2} = \overset{g'}{6}\ \overset{f}{\cos(3x^2)} + \overset{g}{6x} \cdot \overset{f'}{(-\sin(3x^2))} \cdot 6x$

$\frac{d^2y}{dx^2} = 6\cos(3x^2) - 36x^2\sin(3x^2)$

8. (a) Find an equation of the tangent line to the graph of $f(x) = 2\sin x + \cos 2x$ when $x = \pi$.

$0 < x < 2\pi$

(b) Determine all values of x in $(0, 2\pi)$ at which the graph of f has a horizontal tangent.



(a) $f'(x) = 2\cos x + (-\sin(2x) \cdot 2)$

$f'(x) = 2\cos x - 2\sin(2x)$

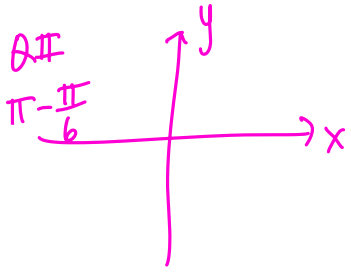
$f'(\pi) = 2\cos\pi - 2\sin 2\pi$

$f'(\pi) = 2(-1) - 2(0) = -2$

$(\pi, 1)$

$f(\pi) = 2\sin\pi + \cos 2\pi = 2(0) + 1 = 1$

$y - 1 = -2(x - \pi)$



$2\cos x - 2\sin 2x = 0$

$2\cos x - 2(2\sin x \cos x) = 0$

$2\cos x - 4\sin x \cos x = 0$

$2\cos x(1 - 2\sin x) = 0$

$2\cos x = 0$ | $1 - 2\sin x = 0$

$\cos x = 0$ | $\sin x = \frac{1}{2}$

$\left\{\frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}\right\}$