Key

AP Calculus AB **Trig Quiz Review WS #5**

Write down your 6 trig derivative rules below!

1) $\frac{d}{dx}\sin u = \cos u \cdot u'$

2) $\frac{d}{dx}\cos u = -\sin u \cdot u'$

3) $\frac{d}{dx}\tan u = \sec^2 u \cdot u'$

4) $\frac{d}{dx}\cot u = -\csc^2 u \cdot u'$

5) $\frac{d}{dx}\sec u = \sec u \tan u \cdot u'$

6) $\frac{d}{dx}\csc u = -\csc u \cot u \cdot u'$

1) If $y = \overbrace{-3x}^{f}\overbrace{\sec(5-\pi x^9)}^{g}$ find $\frac{dy}{dx}$ *product Rule

$y' = \overbrace{-3}^{f'}\cdot\overbrace{\sec(5-\pi x^9)}^{g} + \overbrace{-3x}^{f}\cdot\overbrace{\sec(5-\pi x^9)\tan(5-\pi x^9)\cdot -9\pi x^8}^{g'}$

$y' = -3\sec(5-\pi x^9) + 27\pi x^9 \sec(5-\pi x^9)\tan(5-\pi x^9)$

2) Given $y = \frac{\overbrace{11\cot(\pi x^5)}^{f}}{\underbrace{6\csc(ex)}_{g}}$ Find y' *quotient Rule.

$y' = \frac{\overbrace{-11\csc^2(\pi x^5)\cdot 5\pi x^4}^{f'}\cdot\overbrace{6\csc(ex)}^{g} - \overbrace{11\cot(\pi x^5)}^{f}\cdot\overbrace{-6\csc(ex)\cot(ex)\cdot e}^{g'}}{\underbrace{(6\csc(ex))^2}_{g^2}}$

$y' = \frac{-330\pi x^4\csc^2(\pi x^5)\csc(ex) + 66e\cot(\pi x^5)\csc(ex)\cot(ex)}{36\csc^2(ex)}$

3. Given $y = -\frac{\sqrt[3]{\csc^{11}(3e^2-\pi^2 x)}}{7}$ Find y'

$y = -\frac{1}{7}\left[\csc(3e^2-\pi^2 x)\right]^{11/3}$

*chain Rule

out: $-\frac{1}{7}[\ ]^{11/3}$

in: $\csc(3e^2-\pi^2 x)$

$y' = -\frac{1}{7}\cdot\frac{11}{3}\left[\csc(3e^2-\pi^2 x)\right]^{8/3}\cdot -\csc(3e^2-\pi^2 x)\cot(3e^2-\pi^2 x)\cdot -\pi^2$

$y' = \frac{-11\pi^2}{21}\left[\csc(3e^2-\pi^2 x)\right]^{8/3}\csc(3e^2-\pi^2 x)\cot(3e^2-\pi^2 x)$

* implicit differentiation
* product Rule

4. $ycscy = xcoty - y + 9y^2 - 3x + 11\pi^2$ find $\frac{dy}{dx}$

$1\left(\frac{dy}{dx}\right)\cdot cscy + y\cdot -cscycoty\left(\frac{dy}{dx}\right) = 1\cdot coty + x\cdot -csc^2y\left(\frac{dy}{dx}\right) - 1\left(\frac{dy}{dx}\right) + 18y\left(\frac{dy}{dx}\right) - 3 + 0$

$cscy\left(\frac{dy}{dx}\right) - ycscycoty\left(\frac{dy}{dx}\right) + xcsc^2y\left(\frac{dy}{dx}\right) + 1\left(\frac{dy}{dx}\right) - 18y\left(\frac{dy}{dx}\right) = cot(y) - 3$

$\frac{dy}{dx}\left(cscy - ycscycoty + xcsc^2y + 1 - 18y\right) = cot(y) - 3$

$$\frac{dy}{dx} = \frac{coty - 3}{cscy - ycscycoty + xcsc^2y + 1 - 18y}$$

cosx sinx

* $\frac{5\pi}{6}\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

5) If the position of a particle is x(t) = 7cot(5x)

a) Find a(t)

$v(t) = -7csc^2(5x)\cdot 5$

$v(t) = -35csc^2(5x)$

$v(t) = -35[csc(5x)]^2$

*chain Rule

out: $-35[\ ]^2$

in: $csc(5x)$

$a(t) = -70[csc(5x)]\cdot -csc(5x)cot(5x)\cdot 5$

$$a(t) = 350[csc(5x)]^2cot(5x)$$

b) find acceleration at t = π/6

$a(\pi/6) = 350\left[csc\left(\frac{5\pi}{6}\right)\right]^2 cot\left(\frac{5\pi}{6}\right)$

$= 350\left[\frac{2}{1}\right]^2(-\sqrt{3})$

$= -1400\sqrt{3}$

6. Find the tangent line equation for $f(x) = 2csc^3(7x)$ at $x = \frac{\pi}{6}$

$\frac{7\pi}{6}\left(-\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

$f(x) = 2[csc(7x)]^3$

*chain rule

out: $2[\ ]^3$

in: $csc(7x)$

$f'(x) = 6[csc(7x)]^2\cdot -csc(7x)cot(7x)\cdot 7$

$f'(x) = -42[csc(7x)]^3cot(7x)$

$f'\left(\frac{\pi}{6}\right) = -42\left[csc\left(\frac{7\pi}{6}\right)\right]^3 cot\left(\frac{7\pi}{6}\right)$

$= -42[-2]^3(\sqrt{3}) = 336\sqrt{3}$

$f\left(\frac{\pi}{6}\right) = 2\left[csc\left(\frac{7\pi}{6}\right)\right]^3$

$= 2[-2]^3 = -16$

point: $\left(\frac{\pi}{6}, -16\right)$

slope: $m = 336\sqrt{3}$

$$y + 16 = 336\sqrt{3}\left(x - \frac{\pi}{6}\right)$$