AP Calculus AB

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Product Rule, Quotient Rule, and Trig Derivatives!

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Instructions: Show work or else! Good luck and have fun-ctions!

Fill in the chart. Six points.

$\frac{d}{dx}[sinx] = \cos x$	$\frac{d}{dx}[cosx] = -\sin x$	$\frac{d}{dx}[tanx] = \sec^2 x$
$\frac{d}{dx}[cscx] = -\csc x \cot x$	$\frac{d}{dx}[secx] = \sec x \tan x$	$\frac{d}{dx}[cotx] = -\csc^2 x$

Find the derivative of each. Be sure to use proper notation to show the derivative. **Simplify according to the rules established in class.** 3 points each. Attempt to confine your work to the space provided.

1. $f(x) = (3x^2 - 7x + 5)(3x + 1)$

$f'(x) = (3x^2 - 7x + 5)(3) + (3x+1)(6x-7)$

$f'(x) = 9x^2 - 21x + 15 + 18x^2 + 6x - 7 - 21x$

$f'(x) = 27x^2 - 36x + 8$

2. $y = \frac{4x-3}{7x+2}$

$y' = \frac{(7x+2)(4) - (4x-3)(7)}{(7x+2)^2}$

$y' = \frac{28x + 8 - 28x + 21}{(7x+2)^2}$

$y' = \frac{29}{(7x+2)^2}$

3. $f(x) = sin2x$
Hint: Trig Identity!

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

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

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

Using the chart below, find f'(3) if f(x) is given by each. Show work. 4 points each.

g(3)	g'(3)	h(3)	h'(3)
4	$\frac{1}{2}$	π	-1

7. $f(x) = \frac{g(x)-h(x)}{g(x)}$

$$f'(x) = \frac{g(g'-h') - (g-h)g'}{g^2}$$

$$f'(3) = \frac{4\left(\frac{1}{2}+1\right) - (4-\pi)\frac{1}{2}}{16}$$

8. $f(x) = g(x) \cdot h(x)$

$$f' = g \cdot h' + h \cdot g'$$

$$f'(3) = 4(-1) + \pi\left(\frac{1}{2}\right)$$

9. (6 points) Using the **definition of derivative** find f'(x) if $f(x) = -x^2 - 3x + 1$

$$f'(x) = \lim_{h\to 0} \frac{-(x+h)^2 - 3(x+h) + 1 - (-x^2-3x+1)}{h}$$

$$f'(x) = \lim_{h\to 0} \frac{-(x^2+2xh+h^2) - 3x - 3h + 1 + x^2 + 3x - 1}{h}$$

$$f'(x) = \lim_{h\to 0} \frac{-x^2 - 2xh - h^2 - 3x - 3h + 1 + x^2 + 3x - 1}{h}$$

$$f'(x) = \lim_{h\to 0} \frac{-2xh - h^2 - 3h}{h}$$

$$f'(x) = \lim_{h\to 0} -2x - h - 3$$

$$f'(x) = -2x - 3$$

10. (6 points) Write the equation of line that is tangent to $f(x) = x^2 - 5x + 6$ and **perpendicular** to $2x - 3y = 5$.

$m = \frac{2}{3}$ $m_\perp = -\frac{3}{2}$

$m_\perp = -3$

$f'(x) = 2x - 5$

$2x - 5 = -3$

$2x = 2$

$x = 1$

$2x - 4 = -\frac{1}{3}$

$2x = \frac{11}{3}$

$x = \frac{11}{6}$

$f(1) = 1 - 5 + 6 = 2$

$f\left(\frac{11}{6}\right) = \frac{121}{36} - \frac{11}{6} \cdot 4 + 6$

$f\left(\frac{11}{6}\right) =$

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

ok $y = x + 1$

11. (2 points) Compute $\lim_{t\to 0} \frac{\cos\left(\frac{\pi}{6}-t\right) - \cos\left(\frac{\pi}{6}\right)}{t}$ → $f(x) = \cos x$

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

$f'\left(\frac{\pi}{6}\right) = -\frac{1}{2}$