Derivatives Review

Find the equation of the tangent line at the given point.

1. $y = e^x \sin x$ at (0, 0)

point: $\boxed{(0,0)}$

slope: $y' = (\sin x)(e^x) + (e^x)(\cos x)$

$y'(0) = (0)(1) + (1)(1) = \boxed{1}$

$\boxed{y - 0 = 1(x - 0)}$

2. $y = \dfrac{3\ln x}{x}$ at x = 1

point: $\boxed{(1, 0)}$

slope: $y' = \dfrac{(x)(3 \cdot \frac{1}{x}) - (3\ln x)(1)}{x^2}$

$y'(1) = \dfrac{(1)(3) - (0)(1)}{(1)^2} = \boxed{3}$

$\boxed{y - 0 = 3(x - 1)}$

Higher Order Derivatives

3. Find y'' if $y = \sec(3x)$

$y' = 3(\overset{f}{\sec 3x})(\overset{g}{\tan 3x})$

$y'' = 3\left[(\tan 3x)(3\sec 3x \tan 3x) + (\sec 3x)(3\sec^2(3x))\right]$

$= \boxed{9\tan^2(3x)\sec(3x) + 9\sec^3(3x)}$

4. Find y''(π) if $y = -4e^{\cos x}$

$y' = -4e^{\cos x} \cdot \ln e \cdot -\sin x$

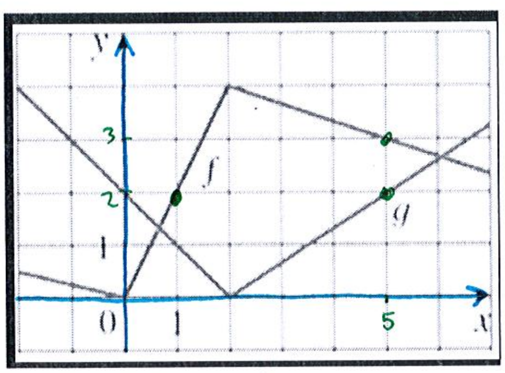
$= 4e^{\cos x} \cdot \sin x$

$y'' = 4(\sin x \cdot e^{\cos x} \cdot -\sin x + e^{\cos x} \cdot (\cos x))$

$y''(\pi) = 4(0 \cdot e^{-1} \cdot 0 + e^{-1} \cdot -1)$

$= \boxed{4(-1/e)}$

Derivatives using graphs and tables



x	h(x)	j(x)	h'(x)	j'(x)
-1	0	-1	2	1
0	-1	-3	-2	4

Find the first derivative of:

5. j(x + h(x)) at x = 0

$= j'(x + h(x)) \cdot (1 + h'(x))$

$= j'(0 + \cancel{h(0)}^{-1}) \cdot (1 + \cancel{h'(0)}^{-2})$

$= j'(-1) \cdot (-1)$

$= 1 \cdot -1 = \boxed{-1}$

6. 3h(x)-j(x) at x = -1

$= 3h'(x) - j'(x)$

$= 3h'(-1) - j'(-1)$

$= 3(2) - (1)$

$= 6 - 1$

$= \boxed{5}$

7. xf(x) at x = 1

$= f(x) \cdot 1 + x \cdot f'(x)$

$= f(1) \cdot 1 + 1 \cdot f'(1)$

because the function value is 2

because the slope is 2

$= (2)(1) + (1)(2)$

$= 2 + 2 = \boxed{4}$

8. f(x)/g(x) at x = 5

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

$= \dfrac{g(5)f'(5) - f(5)g'(5)}{[g(5)]^2}$

$= \dfrac{(2)(-1/3) - (3)(2/3)}{(2)^2} = \dfrac{(-2/3) - (2)}{4} = \boxed{-2/3}$