Bellwork 10/24

Find the equation of a line tangent to $f(x) = e^{\sin(x)}$ at $x = \frac{\pi}{2}$.

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Bellwork 10/24 - Solution

$$f'(x) = \cos(x)e^{\sin(x)}$$

Point-Slope Form: $y - f(0) = f'(0)(x - 0)$

$$\implies y = 0 + f(0)$$

$$\implies \boxed{y = e}$$

Exercise 1

Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ of the implicitly defined curve:

$$e^y + y = x^2$$

Exercise 1 - Solution

$$e^y \left(\frac{\mathrm{d}y}{\mathrm{d}x}\right) + \frac{\mathrm{d}y}{\mathrm{d}x} = 2x$$

$$\left(\frac{\mathrm{d}y}{\mathrm{d}x}\right)(e^y + 1) = 2x$$

$$\boxed{\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{2x}{e^y + 1}}$$

Exercise 2

Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ of the implicitly defined curve:

$$xy^2 = \tan(x)$$

Exercise 2 - Solution

$$2yx\left(\frac{\mathrm{d}y}{\mathrm{d}x}\right)+y^2=\sec^2(x)$$

$$\boxed{\frac{\mathrm{d}y}{\mathrm{d}x}=\frac{\sec^2(x)-y^2}{2yx}}$$

Exercise 3

Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ of the implicitly defined curve:

$$xe^y = 2^{\cos(x)}$$

Exercise 3 - Solution

$$xe^y \left(\frac{\mathrm{d}y}{\mathrm{d}x}\right) + e^y = -\ln(2)2^{\cos(x)}\sin(x)$$

$$\boxed{\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{-\ln(2)2^{\cos(x)}\sin(x) - e^y}{xe^y}}$$