Bellwork 10/17

Find the equation of the tangent line to $f(x) = x^3 + x^2e^x$ at $x = -1$.

Recall: $(uv)' = uv' + vu'$

: : reset

Bellwork 10/17 - Solution

$$f'(x) = 3x^2 + 2xe^x + x^2e^x$$

Point-Slope Form: $y - f(-1) = f'(-1)(x+1)$

$$y = \left(3 - \frac{2}{e} + \frac{1}{e}\right)(x+1) + \left(-1 + \frac{1}{e}\right)$$

$$\boxed{y = \left(\frac{3e-1}{e}\right)x + 2}$$

Exercise 1

Find $\frac{\mathrm{d}y}{\mathrm{d}x}$:

$$y = \frac{3x^2 + 2}{3x^2 + 4}$$

Exercise 1 - Solution

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{(\cancel{3x^2} + 4)(6x) - (\cancel{3x^2} + 2)(6x)}{(3x^2+4)^2}$$

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{(2)(6x)}{(3x^2+4)^2}$$

$$\boxed{\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{12x}{(3x^2+4)^2}}$$

Exercise 2

Find y':

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

Exercise 2 - Solution

$$y' = \frac{(x^2 + x)(2e^x) - (2e^x + 1)(2x + 1)}{(x^2 + x)^2}$$

$$\boxed{y' = \frac{2x^2e^x - 2xe^x - 2e^x - 2x - 1}{(x^2 + x)^2}}$$

Exercise 3

$$f(x) = \frac{x^4}{e^x - x} - x$$

Find the equation of the tangent line to f at $x = 1$.

Exercise 3 - Solution

$$f'(x) = \frac{(e^x - x)(4x^3) - (x^4)(e^x - 1)}{(e^x - x)^2} - 1$$

Point-Slope Form: $y - f(1) = f'(1)(x - 1)$

$$y = \left[\frac{(e-1)(4) - (e-1)}{(e-1)^2} - 1\right](x-1) + \frac{1}{e-1} - 1$$

$$\boxed{y = \left(\frac{4-e}{e-1}\right)x - \frac{2}{e-1}}$$