

(1) Find the equation of the line tangent to  $f(x) = \frac{x^2+1}{e^x}$  at the point where  $x = 0$ .

Solution:

$$\begin{aligned} f'(x) &= \frac{d}{dx} \left( \frac{x^2 + 1}{e^x} \right) \\ &= \frac{e^x \frac{d}{dx}(x^2 + 1) - (x^2 + 1) * \frac{d}{dx}(e^x)}{e^{2x}} \\ &= \frac{e^x(2x) - (x^2 + 1) * e^x}{e^{2x}} \\ &= \frac{-x^2 - 1 + 2x}{e^x} \end{aligned}$$

$$\text{Slope} = f'(0) = \frac{-0-1+2(0)}{e^0} = -1$$

$$f(0) = \frac{0+1}{e^0} = \frac{1}{1} = 1$$

Equation of tangent line will be

$$y - 1 = -1(x-0)$$

$$y = -x + 1$$

Answer:  $y = -x + 1$