

Exercise 22

Find an equation of the tangent line to the curve at the given point.

$$y = e^x \cos x, \quad (0, 1)$$

Solution

With one point known on the line, all that we need to know is its slope. This is found by calculating the derivative of the given curve

$$\begin{aligned} y' &= \frac{d}{dx}(e^x \cos x) \\ &= \left[\frac{d}{dx}(e^x) \right] \cos x + e^x \left[\frac{d}{dx}(\cos x) \right] \\ &= (e^x) \cos x + e^x(-\sin x) \\ &= e^x(\cos x - \sin x) \end{aligned}$$

and evaluating it at $x = 0$.

$$y'(0) = e^0(\cos 0 - \sin 0) = 1$$

Therefore, the equation of the tangent line at $(0, 1)$ is

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

The tangent line and the given curve are shown below.

