Find the particular solution to the differential equation $\frac{dy}{dx} = \frac{xe^x}{cosy}$ if $y(0) = \frac{\pi}{2}$

$$\frac{dy}{dx} = \frac{xe^x}{\cos y}$$

$$\int \cos y \, dy = \int xe^x \, dx$$

Integration by Parts $\int u\frac{dv}{dx}dx = uv - \int v\frac{du}{dx}dx$

$u = x \qquad \frac{dv}{dx} = e^x$

$\frac{du}{dx} = 1 \qquad v = e^x$

$$\sin y = xe^x - \int e^x \, dx$$

$$\sin y = xe^x - e^x + C$$

when $x=0$, $y=\frac{\pi}{2}$

$$\sin\frac{\pi}{2} = 0 \cdot e^0 - e^0 + C$$

$$1 = 0 - 1 + c$$

$$c = 2$$

$$\sin y = xe^x - e^x + 2$$

$$\sin y = e^x(x-1) + 2$$

Give your answer in the form $y = f(x)$

$$y = \arcsin\left(e^x(x-1)+2\right)$$