12. \(3t \frac{dy}{dt} = y \cos t\), \(y(1) = 0\).

Observe that \(y(1) = 0\), and to separate the variables \(t, y\) we need to divide by \(t\) and \(y\).

**Case 1.** \(y(t) = 0\) for all \(t\).

**Case 2.** There exists some \(t^*\) such that \(y(t) \neq 0\). For those \(t\), we divide the equation by \(t\) and \(y\),

\[
3 \frac{1}{y} \frac{dy}{dt} = \frac{\cos t}{t}
\]

\[
\frac{1}{y} dy = \frac{1}{3} \frac{\cos t}{t} dt
\]

\[
\ln|y| = \int \frac{\cos t}{3t} dt
\]

\[
y(t) = C e^{F(t)}
\]

where \(F(t)\) is an anti-derivative of \(\frac{\cos t}{3t}\).

Plug in \(y(1) = 0\):

\[
0 = C e^{F(1)}
\]

Since \(e^{F(1)} > 0\), \(C = 0\).

\[
y(t) = 0 \quad \text{for all } t \quad (t \neq 0)
\]

Which contradicts our assumption for Case 2.

Therefore, 'Case 2' doesn't hold, only 'Case 1' holds,

\[
y(t) = 0 \quad \text{for all } t.
\]