# Problem 2

In each of Problems 1 through 6, determine (without solving the problem) an interval in which the solution of the given initial value problem is certain to exist.

$$t(t-4)y' + y = 0, \qquad y(2) = 1$$

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**Solution**

According to Theorem 2.4.1, a unique solution to

$$y' + p(t)y = g(t), \qquad y(t_0) = y_0$$

exists throughout any interval in $t$ containing the point $t_0$ where the functions, $p(t)$ and $g(t)$, are continuous. Divide both sides of the ODE by $t(t-4)$ to put it in standard form.

$$y' + \frac{1}{t(t-4)}y = 0$$

$p(t)$ is discontinuous at $t = 0$ and $t = 4$. Since $t_0 = 2$ is between 0 and 4, a unique solution will exist for $0 < t < 4$.