

4.39

1 4.39, §1 Asked

Solve:

$$\frac{dx}{dt} = \frac{x}{t}$$

2 4.39, §2 Solution

$$\frac{dx}{dt} = \frac{x}{t}$$

The unknown is clearly $x(t)$.

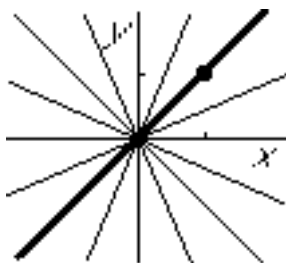
Separation of variables:

$$\frac{dx}{x} = \frac{dt}{t}$$

$$\ln |x| = \ln |t| + C$$

$$e^{\ln |x|} = e^{\ln |t| + C} \implies |x| = |t|e^C \implies x = \pm e^C t$$

$$x = Dt$$



An additional “initial” condition would be needed to find D . For example, $x = 1$ at $t = 1$.

Note: the O.D.E. applies at all positions. Initial or boundary conditions apply only to a specific point.