

2.1: Linear Differential Equations and Integrating Factors

Examples:

$$t^2 \frac{dy}{dt} + 2ty = \cos(t)$$

Given the ODE $ty' + 2y = \sin(t)$, $t > 0$:

a) Plot a direction field. Based on the direction field, describe how solutions behave for large t .

b) Find the general solution.

c) Given the initial condition $y(\pi) = 0$, find the solution and plot it with the direction field.

Given the IVP $ty' + (t+1)y = 2te^{-t}$, $y(1) = a$, $t > 0$:

a) Plot a direction field. Based on the direction field, describe how solutions behave as $t \rightarrow 0$. Estimate the critical value of a for which a transition in this behavior occurs.

b) Solve the IVP.

c) Find the exact critical value from part a). What happens to the solution as $t \rightarrow 0$ when a is this critical value?