Contents

1 First-order ODEs

- **Form:** IVP

$$\frac{dy}{dx} = f(x, y)$$
$$y(x_0) = y_0$$

Test: $f(x, y)$ and $\partial f/\partial y$ are continuous over I
Property: A unique solution is guaranteed over I

1.1 Separable ODEs

- **Form:**

$$\frac{dy}{dx} = g(x)h(y)$$

Solution: Divide by $h(y)$ then with respect to x.

$$\begin{aligned}
\frac{dy}{dx} &= g(x)h(y) \\
\frac{1}{h(y)}\frac{dy}{dx} &= g(x) \\
\int \frac{1}{h(y)}\frac{dy}{dx}\,dx &= \int g(x)\,dx \\
\int \frac{1}{h(y)}\,dy &= \int g(x)\,dx \\
H(y) &= G(x) + c
\end{aligned}$$