

Here's a few drill problems. These equations are all separable first order ordinary differential equations. The answers were provided by Maple and may not be in exactly the form you will obtain. The Maple work is available on my website as a Maple worksheet: `256w2002-separable-ode.mws`

**Problem 0115 – 1.**

$$\frac{dy}{dt} = \frac{y+3}{t+1}$$

**Ans:**  $y = (t+1)c - 3$

**Problem 0115 – 2.**

$$\frac{dy}{dt} = \frac{3t+1}{e^y + \sin(y)}$$

**Ans:**  $\frac{3}{2}t^2 + t - e^y + \cos(y) + c = 0$

**Problem 0115 – 3.**

$$\frac{dy}{dx} = \sqrt{y+1} \sin(x), \quad y(0) = 2$$

**Ans:**  $y = \frac{9}{4} + \frac{1}{4} \cos(x)^2 - \frac{1}{2} \cos(x) - \cos(x)\sqrt{3} + \sqrt{3}$

**Problem 0115 – 4.**

$$\frac{dy}{dx} = (x-1)(y+1)^{\frac{1}{3}}$$

**Ans:**  $\frac{1}{2}x^2 - x - \frac{3}{2}(y+1)^{\frac{2}{3}} + C = 0$

A more explicit answer is possible:

$$y = -1 + \frac{1}{9} \sqrt{-18x^5 + 18x^4c + 3x^6 + 36x^2c^2 - 24x^3 + 36x^4 - 72x^3c + 24c^3 + 72x^2c - 72xc^2},$$

$$y = -1 - \frac{1}{9} \sqrt{-18x^5 + 18x^4c + 3x^6 + 36x^2c^2 - 24x^3 + 36x^4 - 72x^3c + 24c^3 + 72x^2c - 72xc^2}$$

**Problem 0115 – 5.**

$$\frac{ds}{dt} = \frac{e^{s+t}}{t+1}, \quad s(1) = 1$$

**Ans:**  $s = -\log\left(e^{-1} - \int_1^t \frac{e^r}{r+1} dr\right)$

**Problem 0115 – 6.**

$$\frac{du}{dt} = \frac{\sec^2(u)}{t^2+1}$$

**Ans:**  $2u - 4 \arctan(t) + \sin(2u) - 4c = 0$