

### MATH224. Homework 3.

1. Solve the following second order differential equations with the initial conditions  $y(0) = 1$ ,  $y'(0) = -1$ :

(i) 
$$\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = 2e^x$$

(ii) 
$$\frac{d^2y}{dt^2} + 6\frac{dy}{dt} + 9y = 3t + 5$$

(iii) 
$$y'' + 2y' + 2y = \sin x$$

2. Find the general solutions for the following first order equations:

(i) 
$$2x^2y y' + 1 + 2xy^2 = 0$$

(ii) 
$$\frac{dy}{dx} = - (2x + \ln y) \frac{y}{x}$$

3. [Short problems.] The following are examples of expressions found when solving separable equations. Solve them to find  $y$ .

(i) 
$$\frac{1}{y+3} = x + x^2 + C$$

(ii) 
$$\ln(y+1) = 4\ln(t+3) - 2\ln(t) + A$$

(iii) 
$$e^{y^2} = x^2 + C$$

(iv) 
$$\frac{1}{y} = \frac{1}{t} + B$$

(v) 
$$\ln(y+1) - \ln(y) = 3\ln(x+1) - 3\ln(x-1) + \ln C$$