

Quiz 3

You are being asked to show your work in answering the following questions. Full points will be awarded only for correct application of the method, and the correct answer.

1. (1 point) Given the following second order ODE

$$y'' + 4y = 0$$

find a general solution and write it in terms of trigonometric functions (*Hint: Euler's formula.*)

2. Given the following inhomogeneous second order ODE

$$y'' - 2y' - 3y = 3e^{2t}$$

- (a) (1 point) One solution is given by $y_1(t) = e^{-t}$. Use reduction of order (*hint: $y_2(t) = v(t)y_1(t)$*) to find the other solution. Show your work!
- (b) (1 point) Use the method of undetermined coefficients to find a particular solution to the inhomogeneous problem. That is, pick a substitution that seems reasonable, e.g. $Y(t) = a_0 + a_1t + \dots a_nt^n$ or $Y(t) = A \sin(t) + B \cos(t)$ or $Y(t) = \exp(\alpha t)$, or some other combination, and find Y .

Hint: you may use other methods to check your answers.

3. Use the method of variation of parameters to find the *general solution* to the equation

$$x'' + x = 5.$$

- (a) (0.5 points) Write and solve the matrix equation for $(u'_1, u'_2)^t$ to find a particular solution. (*Hint: recall the conditions $u'_1x_1 + u'_2x_2 = 0$ and $u'_1x'_1 + u'_2x'_2 = g(t)$ for the generic case.*)
- (b) (0.5 points) Write down the general solution of the equation.