

Please put your work on this page. Box your answers. Thanks and enjoy. You have 6 minutes to complete this quiz.

Problem 1 Find the general solution of $y'' + 3y' + 2y = 0$.

Solution: observe the characteristic equation is $\lambda^2 + 3\lambda + 2 = 0$. Observe that $\lambda^2 + 3\lambda + 2 = (\lambda + 1)(\lambda + 2) = 0$ gives $\lambda = -1$ and $\lambda = -2$ thus

$$y = c_1 e^{-x} + c_2 e^{-2x}.$$

Problem 2 Find the solution of $y'' + 9y = 0$ with $y(0) = 1$ and $y'(0) = 0$.

Solution: observe the characteristic equation is $\lambda^2 + 9 = 0$ and we find solutions $\lambda = \pm 3i$. Thus

$$y = c_1 \cos(3x) + c_2 \sin(3x).$$

Now $y(0) = c_1 \cos(0) + c_2 \sin(0) = c_1 = 1$ and $y'(0) = -3c_1 \sin(0) + 3c_2 \cos(0) = 3c_2 = 0$ thus the solution to the given initial value problem is $y = \cos(3x)$.

Problem 3 Solve $y'' - 6y' + 9y = 0$.

Solution: observe the characteristic equation is $\lambda^2 - 6\lambda + 9 = (\lambda - 3)^2 = 0$ and we find solutions $\lambda = 3$ twice. Thus

$$y = c_1 e^{3x} + c_2 x e^{3x}.$$

Notice that we could have given answers in terms of independent variable t rather than x as the prime notation does not really dictate the choice of x over t .