

Math 189 – Section 31.7/8: Sol'ns to 2nd-order Linear DEs

Second-order homogeneous linear DEs of the form

$$ay'' + by' + cy = 0$$

have solutions of form $y = e^{mx}$ where the m 's are the solutions to the auxiliary equation $am^2 + bm + c = 0$.

So, to solve this type of DE:

1. Write the auxiliary equation $am^2 + bm + c = 0$ and solve for m .
2. If the auxiliary equation has two real solutions m_1 and m_2 , then

$$y = C_1 e^{m_1 x} + C_2 e^{m_2 x}$$

3. If the auxiliary equation has one real repeated solution m , then

$$y = (C_1 + C_2 x) e^{mx}$$

4. If the auxiliary equation has two complex solutions $m = \alpha \pm \beta i$, then

$$y = e^{\alpha x} (C_1 \cos \beta x + C_2 \sin \beta x)$$