

$$5 \cdot y'' - 4y' - y = 0$$

$$5r^2 - 4r - 1 = 0 \quad \Delta = b^2 - 4ac = (-4)^2 - 4 \cdot 5 \cdot (-1) = 16 + 20 = 36$$

$$r_1 = \frac{-b - \sqrt{\Delta}}{2a} = \frac{4 - 6}{2 \cdot 5} = \frac{-2}{10} = -\frac{1}{5}$$

$$r_2 = \frac{-b + \sqrt{\Delta}}{2a} = \frac{4 + 6}{2 \cdot 5} = \frac{10}{10} = 1$$

$$y = C_1 \cdot e^{-\frac{1}{5}x} + C_2 \cdot e^x$$

$$4 \cdot y'' - 4 \cdot y' + y = 0 \quad \Delta = b^2 - 4ac = (-4)^2 - 4 \cdot 4 \cdot 1 = 16 - 16 = 0$$

$$4r^2 - 4r + 1 = 0 \rightarrow \text{characteristic equation}$$

$$r_0 = \frac{-b - \sqrt{\Delta}}{2a} = \frac{4 - 0}{2 \cdot 4} = \frac{4}{8} = \frac{1}{2}$$

$$y = C_1 \cdot e^{\frac{1}{2}x} + C_2 \cdot e^{\frac{1}{2}x}$$

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

$$\Delta = 0^2 - 4 \cdot 1 \cdot 4 = -16$$

$$i^2 = -1$$

$$r^2 + 4 = 0$$

$$r^2 = -4 \rightarrow r = \sqrt{-4}$$

$$r = \pm 2i = \alpha + \beta i$$

$$r = \pm 2i$$

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

$$y = C_1 \cdot e^{0x} \cdot \cos 2x + C_2 \cdot e^{0x} \cdot \sin 2x$$

$$4 \cdot y'' - 4 \cdot y' + 2 \cdot y = 0$$

$$4r^2 - 4r + 2 = 0 \quad \Delta = b^2 - 4ac = (-4)^2 - 4 \cdot 4 \cdot 2 = 16 - 32 = -16$$

$$i^2 = -1$$

$$\sqrt{\Delta} = \sqrt{-16} = \pm 4i$$

$$r_1 = \frac{-b - \sqrt{\Delta}}{2a} = \frac{4 - 4i}{2 \cdot 4} = \frac{4}{8} - \frac{4i}{8} = \frac{1}{2} - \frac{1}{2}i \Rightarrow \alpha = \frac{1}{2} \quad \beta = -\frac{1}{2}$$

$$r_2 = \frac{-b + \sqrt{\Delta}}{2a} = \frac{4 + 4i}{2 \cdot 4} = \frac{4}{8} + \frac{4i}{8} = \frac{1}{2} + \frac{1}{2}i$$

$$y = C_1 \cdot e^{\frac{1}{2}x} \cdot \cos \frac{1}{2}x + C_2 \cdot e^{\frac{1}{2}x} \cdot \sin \frac{1}{2}x$$