1.

2. Solve the initial value problem $y'' + 4y = 0$ with $y(0) = 2$ and $y'(0) = 0$.

\[ r^2 + 4 = 0 \implies r = 0 \pm 2i. \]

\[ y = C_1 \cos(2t) + C_2 \sin(2t) \implies 2 = y(0) = C_1 \]

and since \( y' = -2C_1 \sin(2t) + 2C_2 \cos(2t) \implies 0 = y'(0) = 2C_2 \)

so we have $y = 2 \cos(2t)$

3. Find the general solution $y'' + 12y' + 36y = 0$.

\[ r^2 + 12r + 36 = 0 \implies (r + 6)^2 = 0 \implies r = -6, -6. \]

\[ y = C_1 e^{-6t} + C_2 te^{-6t} \]