Review of 2nd order homog. eqn's with constant coeff.

Ex 1 (char. poly. has two distinct real roots)

$$y'' - 8y' + 15y = 0$$

char eq: $r^2 - 8r + 15 = 0$

$$(r-3)(r-5) = 0$$

$$r = 3, 5$$

$$\Rightarrow \quad y = c_1 e^{3t} + c_2 e^{5t}$$

Ex2 (char. poly. has complex roots)

$$y'' + 4y' + 13y = 0$$

char eq: $r^2 + 4r + 13 = 0$

$$r = -2 \pm 3i$$

$$y = c_1 e^{-2t}\cos(3t) + c_2 e^{-2t}\sin(3t)$$

Ex3 (char. poly. has one real root)

$$y'' - 6y' + 9y = 0$$

char eq: $r^2 - 6r + 9 = 0$

$$(r-3)^2 = 0$$

$$r = 3, 3$$

$$y = c_1 e^{3t} + c_2 t e^{3t}$$