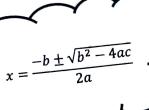
Section 13: Nonhomogeneous Second Order DE



2nd Order ODEs

$$ay'' + by' + cy = f(t)$$

Homogenous

$$f(t) = 0$$

Nonhomogenous

$$f(t) = not 0$$

2 (Distinct) Real

2 (Repeated) Real

2 (Conjugate) Complex

$$y_1(t) = e^{r_1 t}$$
$$y_2(t) = e^{r_2 t}$$

$$y_1(t) = e^{rt}$$
$$y_2(t) = te^{rt}$$

$$r = \alpha \pm i\beta$$
$$y_1(t) = e^{\alpha t} \cos \beta t$$

$$y_2(t) = e^{\alpha t} \sin \beta t$$

y(t), ent + czerzt

y(t) czert + cztert

 $y(t)_{c1e^{\alpha t}\cos\beta t} + c2e^{\alpha t}\sin\beta t$

Use homogenous solutions combined with Good Guessing (formally called Method of Undetermined Coefficients)

Trial Solutions for the Method of Undetermined Coefficients

Form of g(x)

Guess for particular solution

- 1. 1 (any constant)
- 2. 5x + 7
 - Ax + B

Α

- 3. $3x^2 2$
- $Ax^2 + Bx + C$
- 4. $\sin 4x$
- $A\cos 4x + B\sin 4x$
- 5. $\cos 4x$
- $A\cos 4x + B\sin 4x$

6. e^{5x}

- Ae^{5x}
- 7. $(9x-2)e^{5x}$
- $(Ax+B)e^{5x}$
- 8. x^2e^{5x}
- $(Ax^2 + Bx + C)e^{5x}$ increase Polynomial if not applicable
- 9. $e^{3x}\sin 4x$
- $Ae^{3x}\cos 4x + Be^{3x}\sin 4x$
- 10. $5x^2 \sin 4x$
- $(Ax^2 + Bx + C)\cos 4x + (E^2 + Fx + G)\sin 4x$
- 11. $xe^{3x}\cos 4x$
- $(Ax + B)e^{3x}\cos 4x + (Cx + E)e^{3x}\sin 4x$
- 12. $(5x + 7) + \sin 4x$
- $(Ax + B) + (C\cos 4x + D\sin 4x)$