

# Undetermined Coefficients

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# Agenda

1. Review HW p. 14.1 #1-23 odd
2. Determine the general solution of a nonhomogeneous second order diff. eq. using undetermined coefficients.



## Second Order Nonhomogeneous Diff. Eq. with constant coefficients:

$$y'' + py' + qy = r(x)$$

**Recall:** The general solution of  $y'' + py' + qy = 0$

is of the form:

where  $y_1$  and  $y_2$

$$m^2 + pm + q = 0$$



**Theorem:** The general solution  $y_g$  of the second order nonhomogeneous differential equation with constant coefficients

$$y'' + py' + qy = r(x)$$

is of the form:

$$y_g = y_c + y_p$$

where  $y_c$  is the solution to the characteristic equation and  $y_p$  is any particular solution of the nonhomogeneous diff. eq.





**Example:**  $y \quad y \quad 6y \quad e^{3x}$

$$m^2_-$$







**Example:**  $y'' - 2y' + y = \sin 2x$

$$m^2 - 2m + 1 = 0$$



If  $r(x)$  is of the form...

make  $y_p$  of the form...

$$ke^{ax}$$

$$Ae^{ax}$$

$$a_0 \quad a_1x \quad a_2x^2 \quad a_nx^n$$

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$$a_1 \cos bx \quad a_2 \sin bx$$

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Homework:

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