4.4 - Undetermined Coefficients–Superposition Approach

4.4a

The techniques in this lesson apply to nonhomogeneous DEs of the form $a_n y^{(n)} + a_{n-1} y^{(n-1)} + \cdots + a_1 y' + a_0 y = g(x)$ whose input functions (that is, $g(x)$) are constants, polynomials, exponentials, sines and cosines, and sums and products of these.

From 4.1: Consider $y'' - 6y' + 5y = -9e^{2x} + 5x^2 + 3x - 16$

4.4b

Example: Solve the given differential equation by undetermined coefficients.

$y'' - 8y' + 20y = 100x^2 - 26xe^x$

4.4c

Example: $y'' - 16y = 2e^{4x}$

Example: $4y'' - 4y' - 3y = \cos 2x$

y_p forms, assuming no redundancy

$g(x)$	y_p
$3x^2 + 2$	
$7e^{4x}$	
$8x^2e^{2x}$	
$3 \sin 2x$	
$x \cos 3x$	