

## Method of Undetermined Coefficients:

Remark: *Limitations of the method.* In contrast to variation of parameters, which can be applied to any nonhomogeneous equation, the method of undetermined coefficients can be applied only to nonhomogeneous equations of the form  $y'' + ay' + by = f(x)$  where  $a$  and  $b$  are constants and the nonhomogeneous term  $f$  is a polynomial, an exponential function, a sine, a cosine, or a combination of such functions.

A particular solution of  $y'' + ay' + by = f(x)$

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If  $f(x) =$

try  $z(x) =$

$ce^{rx}$

$Ae^{rx}$

$c \cos \beta x + d \sin \beta x$

$z(x) = A \cos \beta x + B \sin \beta x$

$ce^{\alpha x} \cos \beta x + de^{\alpha x} \sin \beta x$

$z(x) = Ae^{\alpha x} \cos \beta x + Be^{\alpha x} \sin \beta x$

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**Note:** The first line includes the case  $r = 0$ ;

if  $f(x) = ce^{0x} = c$ , then  $z = Ae^{0x} = A$ .