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We are now going to look at second order, linear, constant coefficient *non–homogeneous* equations. That is, equations of the form:

$$ax''(t) + bx'(t) + cx(t) = g(t).$$

Here, x is the unknown function and a, b, c and $g(t)$ are all known (a, b, c are constants).
There are (typically) two parts in the strategy to solve such an equation:

(1)

(2)

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Find the general solution to:

$$x''(t) - 3x'(t) - 4x(t) = 3e^{2t}.$$

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Find the general solution to:

$$x''(t) - 3x'(t) - 4x(t) = \cos t.$$

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Find the general solution to:

$$x''(t) - 3x'(t) - 4x(t) = t^2 + 1.$$

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Consider an equation like:

$$ax''(t) + bx'(t) + cx(t) = g_1(t) + g_2(t).$$

Suppose that it is known that $x_{P1}(t)$ and $x_{P2}(t)$ are particular solutions to:

$$ax''(t) + bx'(t) + cx(t) = g_1(t) \qquad \text{and} \qquad ax''(t) + bx'(t) + cx(t) = g_2(t),$$

respectively. Then if $x_H(t)$ is the general solution to the CHE, the function:

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Find the general solution to:

$$x''(t) - 3x'(t) - 4x(t) = 3e^{2t} + \cos t + t^2 + 1.$$

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Find the general solution to:

$$x''(t) - 3x'(t) - 4x(t) = 2e^{4t}.$$

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Find the general solution to:

$$x''(t) - 2x'(t) + 2x(t) = e^t \cos t.$$

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Find the general solution to:

$$x''(t) - 2x'(t) + x(t) = te^{2t}.$$

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Find the general solution to:

$$x''(t) - 2x'(t) + x(t) = te^t.$$

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