TW244 **Tutoriaal / Tutorial #4**

Probleem 1: Vind die algemene oplossing van elkeen van die volgende nie-homogene DVs:

Problem 1: Find the general solution of each of the following non-homogeneous DEs:

(a) $y'' - 8y' + 16y = -10\cos(3x)$

(b) $y'' + 6y' + 13y = e^{-x}(1 - x)$

Probleem 2: Los die volgende 2de-orde lineêre aanvangswaardeprobleem op:

$$2y'' + 4y' - 16y = x - e^x, \quad y(0) = 1, \quad y'(0) = -\tfrac{1}{4}.$$

Problem 2: Solve the following 2nd-order linear initial value problem:

Probleem 3: Gebruik die "Variation of parameters" metode om die volgende 2-de orde linêre beginwaardeprobleem op te los:

$$y'' + 2y' + y = e^{-x}\log(x), \quad y(0) = 0, \quad y'(0) = 0.$$

Problem 3: Use the method of variation of parameters to solve the following 2nd-order linear initial value problem:

Probleem 4: Toon aan dat Green se funksie vir die DV in Probleem 3 as volg geskryf kan word

$$G(x,t) = e^{-(x-t)}(x - t),$$

en daarom kan die spesifieke oplossing uitgedruk word as

$$y_p(x) = e^{-x}\int^x (x - t)\log(t)\,dt.$$

Problem 4: Show that the Green's function for the DE in Problem 3 may be written as

and hence that the particular solution may therefore be expressed as

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Probleem 5: Los die volgende lineêre aanvangswaardeprobleem op:

$$\frac{dx}{dt} = x - y, \quad \frac{dy}{dt} = y - x, \quad x(0) = 4, \quad y(0) = -2.$$

Wenk: Skryf die stelsel in D-notasie as volg:
$(D-1)x + y = 0$ en $x + (D-1)y = 0$,
elimineer dan vir y om 'n 2de-orde DV in x te kry.

Problem 5: Solve the following linear initial value problem:

Hint: Write the system in D-notation, as follows:
$(D-1)x + y = 0$ and $x + (D-1)y = 0$,
then eliminate y to obtain a 2nd-order DE in x.

Probleem 6: Vind die 2-parameter familie van oplossings vir die volgende stelsel van DVs:

$$\frac{dx}{dt} = x + 5y - t^2, \quad \frac{dy}{dt} = -2x - y + \tfrac{3}{5}t.$$

Problem 6: Find the 2-parameter family of solutions for the following system of DEs:

Probleem 7: Los die eerste-orde aanvangswaardeprobleem op vir die vermengingstoepassing wat ons in lesing 15 afgelei het:

$$\frac{da}{dt} = -\tfrac{2}{25}a + \tfrac{1}{50}b, \quad \frac{db}{dt} = \tfrac{2}{25}a - \tfrac{2}{25}b, \quad a(0) = 25, \quad b(0) = 0.$$

Problem 7: Solve the first-order initial value problem we derived for the mixing application in lecture 15:
