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DSC-VI : Practical-05

Method of Variation of Parameters

1 Solve y'' - y = x

Sol: The general solution comprises of two parts: y = y_c + y_p

We have:

```
--> de : ' diff ( y , x , 2 ) - y = x ;     /* our d.e. */
    hp : lhs ( de ) = 0 $    /* homogeneous part */
    r : rhs ( de ) $         /* `r` i.e. non-homogeneous part */
```

$$\frac{d^2}{dx^2}y - y = x$$

1.1 Calculating y_c

```
--> y_c : rhs ( ode2 ( hp , y , x ) ) ;
    y_1 : exp ( x ) $
    y_2 : exp ( - x ) $
```

$$\%k1\%e^{x} + \%k2\%e^{-x}$$

1.2 Calculating y_p

```
--> A : matrix (
      [ y_1 , y_2 ] ,
      [ diff ( y_1 , x ) , diff ( y_2 , x ) ]
    ) ;
```

$$\begin{pmatrix} \%e^{x} & \%e^{-x} \\ \%e^{x} & -\%e^{-x} \end{pmatrix}$$

```
--> W : determinant ( A ) ;
```

$$-2$$

We now find u_1 and u_2

```
--> u_1 : integrate ( - y_2 · r / W , x ) ;
    u_2 : integrate ( y_1 · r / W , x ) ;
```

$$\frac{(-x-1)\%e^{-x}}{2}$$

$$-\frac{(x-1)\%e^{x}}{2}$$

Now, our y_p is:

```
--> y_p : ratsimp ( u_1 · y_1 + u_2 · y_2 ) ;    /* this will return a simplified expression */
```

$$-x$$

1.3 General Solution

The general solution (y=y_c+y_p):

```
--> 'y = y_c + y_p ;
```

$$y = \%\mathrm{k1}\%e^{x} + \%\mathrm{k2}\%e^{-x} - x$$

Created with wxMaxima.
The source of this Maxima session can be downloaded here.