Matlab-5

Laplace Transformation

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LAPLACE TRANSFORMATION

Experiment 5 (12/09/2016)

Aim:

(1) Solve the initial value problem: dy/ dt + 2y(t) = sin(t) with y(0) = 1and also visualize the obtained solution.

(2) Take any problem on piece-wise continuous function and find the Laplace transform for it.

New Commands:

laplace(f): To find the Laplace transform of a scalar symbol f with **default** independent variable t. The **default** return is a function of s.

laplace(f,w): Returns the Laplace transform of f in symbol w instead of the default s.

laplace(f,x,w): Assumes f as a function of the symbolic variable x and returns the Laplace transform as a function of w.

ilaplace(F): To find the inverse Laplace transform of the scalar symbolic object F with default independent variable s. The default return is a function of t.

ilaplace(F,x): Returns the inverse Laplace transform of the function F as a function of x instead of the default t.

ilaplace(F,w,x): Assumes F as a function of the symbolic variable w and returns the inverse Laplace transform of F as a function of x.

heaviside(t-a): To input the Heaviside unit step function u(t − a).

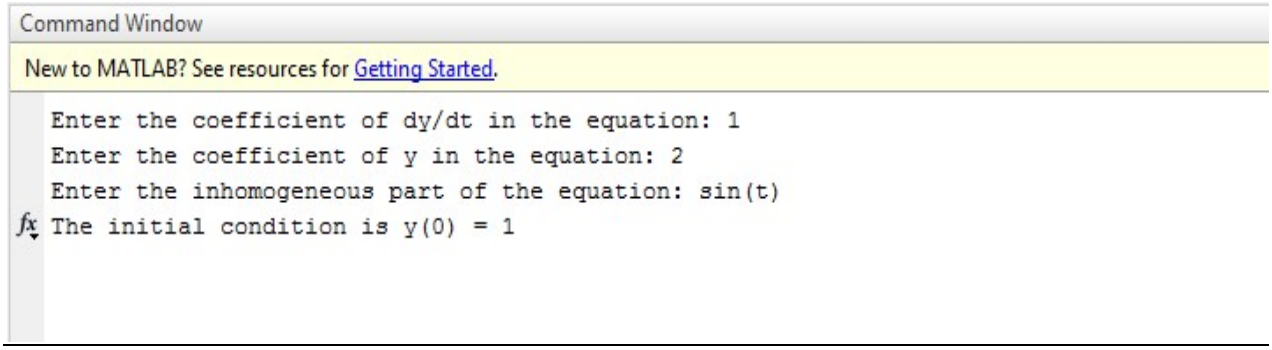
dirac(t-a): To input the dirac delta function δ(t − a).

For part (1):

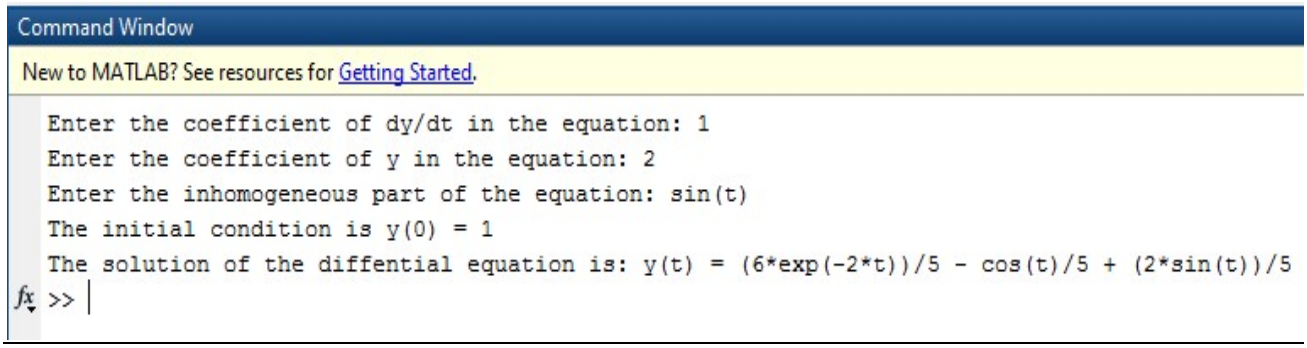
The code:

```
clc
clear all
syms t s Y
y = sym('y(t)'); % writing y as a function of t
y1 = diff(y,t); % Derivative of y(t) in symbolic form
a = input('Enter the coefficient of dy/dt in the equation: ');
b = input('Enter the coefficient of y in the equation: ');
f = input('Enter the inhomogeneous part of the equation: ');
y0 = input('The initial condition is y(0) = ');
eqnt = a*y1 + b*y - f; % Differential equation in the form eqnt = 0
eqns = laplace(eqnt,s); % Taking Laplace transform of the DE
eqns = subs(eqns,{'laplace(y(t), t, s)','y(0)'},{Y,y0});
Y = simplify(solve(eqns,Y)); % Solving algebraic equation eqns = 0 for Y and
simplifying
y = ilaplace(Y,s,t); % Taking inverse Laplace transform of Y to get y
disp(['The solution of the diffential equation is: y(t) = ',char(y)])
```

Input:



Output:



For part (2):

The Question:

Find Laplace transform of the function f(x) = x^2 , $0 \le x < 1$;

x, $1 \le x < 2$;

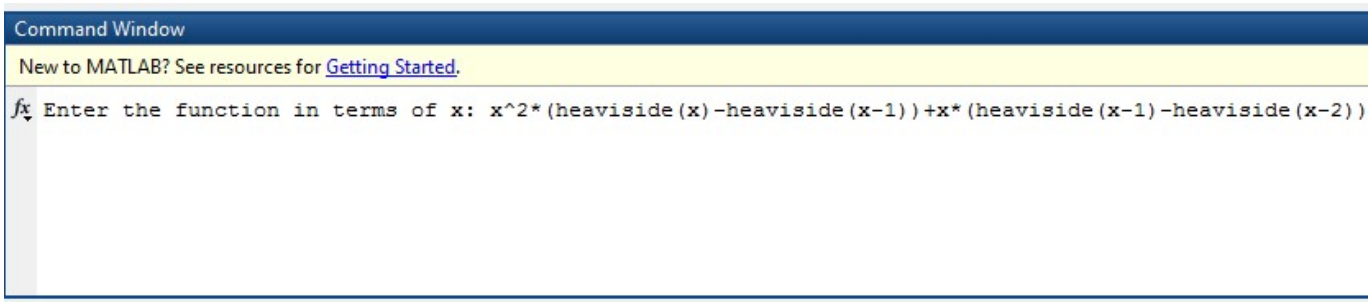
0, $x \ge 2$

in terms of w.

The code:

```
clc
syms x w
f = input('Enter the function in terms of x: ');
F = laplace(f,x,w)
```

Input:



Output: