Modelling and control summaries

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Inverse Laplace 7 – using MATLAB

NUMERICAL TECHNIQUES FOR SOLVING INVERSE LAPLACE USING MATLAB

The previous note demonstrated the use of ilaplace.m to do an analytical inverse Laplace. In order to find numerical values, the resulting expression is used in the file subs.m

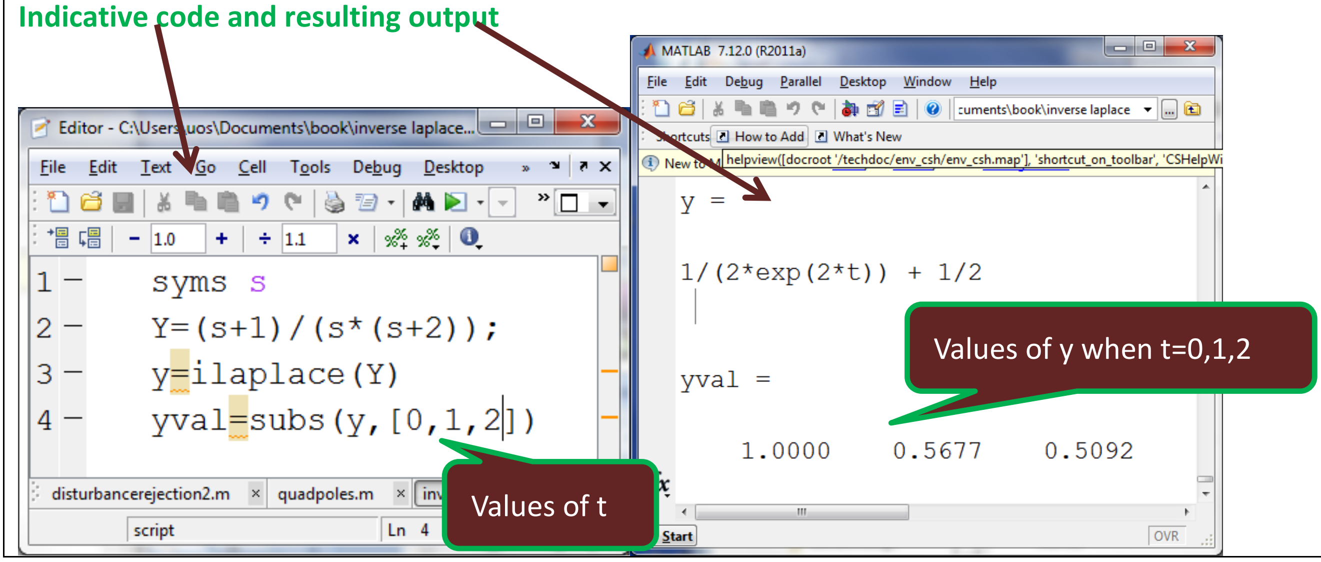
MATLAB also has other tools in the control toolbox which form numerical values directly.

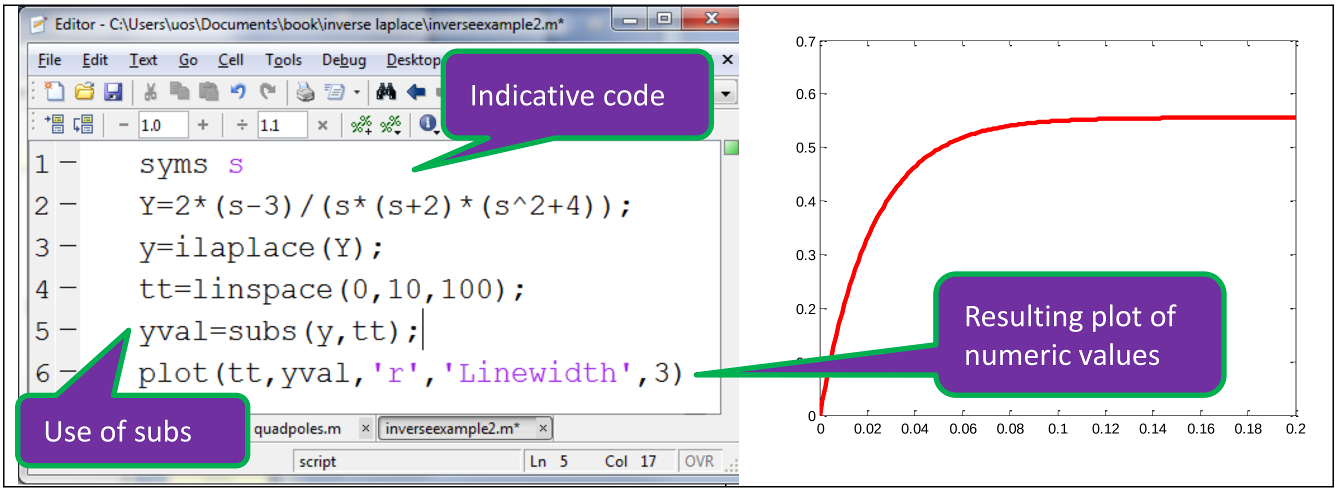
SYSMBOLIC TOOLBOX APPROACHES

1. One can determine the numeric values of the inverse Laplace using *subs.m*
2. *subs* is short for substitute. In other words substitute in the required values of the independent variable.

So the equivalent of **y=f(x)** in MATLAB code is **y=subs(f,x)** where f is the symbolic expression and x are numeric values.

Indicative code and resulting output





CONTROL TOOLBOX:

1. Includes two main files (step.m, impulse.m) for doing inverse Laplace which give the numeric solutions only.
2. Students can get: (i) just a plot or (ii) the numeric values in the workspace.

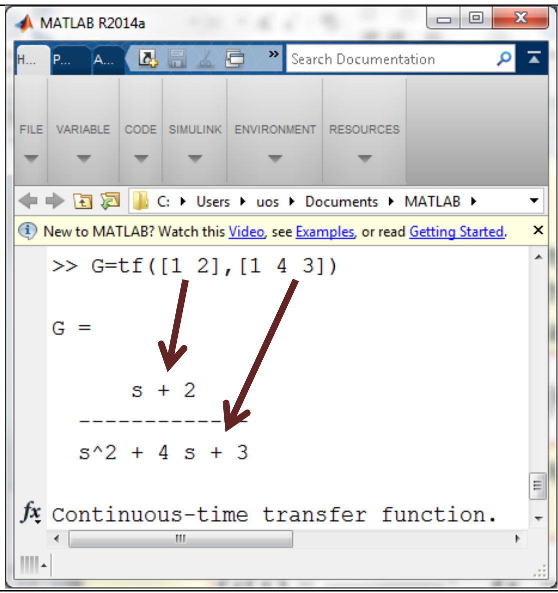
ASSUMES THE LAPLACE TRANSFORM IS ENTERED USING tf.m

Use of tf.m

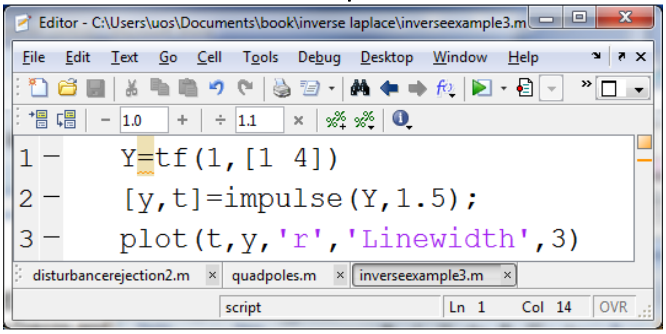
- Takes 2 arguments, the numerator coefficients and the denominator coefficients.
- The linkage between the command and the resulting transfer function should be obvious.

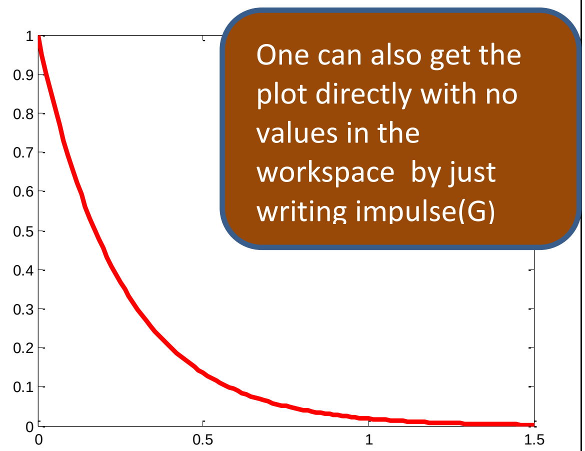
Example:
>>G= tf([1 3 4],[2 3 -1 0]) would give

$$G = \frac{s^2 + 3s + 4}{s^3 + 3s^2 - s}$$



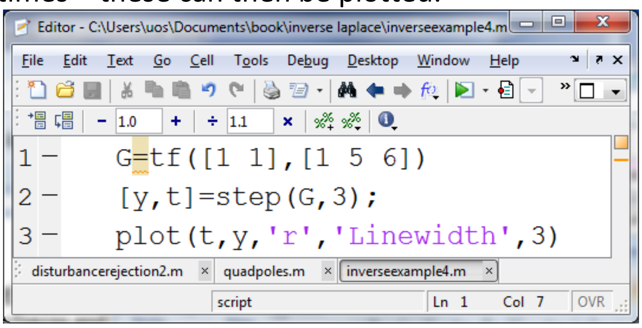
impulse.m does the inverse Laplace directly and produces the numeric values and corresponding times – these can then be plotted.

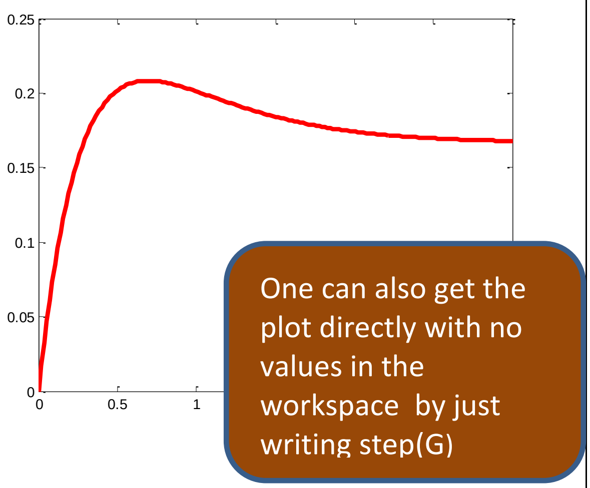




Use >>help impulse to find out more

step.m does the inverse Laplace afer first multiplying by a unit step function (1/s) and produces the numeric values and corresponding times – these can then be plotted.





Use **>>help step** to find out more