

MATH.2360 Engineering Differential Equations

MATLAB commands related to the Laplace Transform

Click on the “New Live Script” button on the toolbar.

Try entering the following commands in the live script window to see how MATLAB can be used to find the Laplace transform or inverse transform of a given function. Click on the Run button after you type in the commands. These commands will generate the Laplace transforms of $t - 2e^{3t}$ and $u(t - \pi) \sin(t - \pi)$ and the inverse transform of $3/s^4$.

DO NOT USE A PERIOD BEFORE * OR / OR ^
NONE OF YOUR ANSWERS SHOULD CONTAIN $\delta(t)$.

```
syms t s %This tells MATLAB to treat the variables t and s as symbols rather than arrays.  
laplace(t - 2*exp(3*t)) %The laplace command finds the laplace transform  
laplace heaviside(t-pi)*sin(t-pi) %heaviside(t-pi) means u(t-pi)  
ilaplace(3/s^4) %The ilaplace command finds the inverse laplace transform
```

Homework problems you can solve using the laplace and ilaplace commands:

7.1 Please write down your answers and turn them in with the rest of the section 7.1 homework.

Find the Laplace transforms of the following functions:

1) $\sqrt{t} + 3t$ 2) $t - 2e^{3t}$ 3) $1 + \cosh(5t)$

Find the inverse Laplace transforms of the following functions:

1) $\frac{3}{s^4}$ 2) $\frac{1}{s} - \frac{2}{s^5/2}$ 3) $\frac{3}{s-4}$ 4) $\frac{5-3s}{s^2+9}$ 5) $\frac{10s-3}{25-s^2}$

7.3 These are all the homework problems from section 7.3.

Find the Laplace transforms of the following functions:

1) $t^4 e^{\pi t}$, 2) $e^{-2t} \sin(3\pi t)$

Find the inverse Laplace transform of the following functions:

1) $\frac{3}{2s-4}$ 2) $\frac{1}{s^2+4s+4}$ 3) $\frac{3s+5}{s^2-6s+25}$ 4) $\frac{1}{s^2-4}$ 5) $\frac{5-2s}{s^2+7s+10}$
6) $\frac{1}{s^3-5s^2}$

7.5 Please write down your answers and turn them in with the rest of the section 7.5 homework.

Find the inverse Laplace transforms of the following functions:

1) $\frac{e^{-3s}}{s^2}$ 2) $\frac{e^{-\pi s}}{s^2+1}$ 3) $\frac{s(1+e^{-3s})}{s^2+\pi^2}$

You can also use the laplace command to find the answers to problems 13 and 17 after you write the given functions in terms of unit step functions.