

Engineering Differential Equations
MATLAB commands related to the Laplace Transform

Try the following commands to see how MATLAB can be used to find the Laplace transform or inverse transform of a given function. These commands will generate the Laplace transforms of $t - 2e^{3t}$ and $u(t - \pi)\sin(t - \pi)$ and the inverse transform of $\frac{3}{s^4}$.

DO NOT USE A PERIOD BEFORE * OR / OR ^
YOU ONLY HAVE TO ENTER THE syms COMMAND ONCE
YOU SHOULD NOT GET ANY ANSWERS WITH dirac IN THEM.

```
syms t s pi
laplace(t-2*exp(3*t))
pretty(ans)
laplace heaviside(t-pi)*sin(t-pi) %Note: heaviside(t-pi) means  $u(t - \pi)$ 
pretty(ans)
ilaplace(3/s^4)
pretty(ans)
```

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:

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

Find the inverse Laplace transform of the following functions:

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

7.3 These are all the homework problems from section 7.3. Find the Laplace transforms of the following functions:

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

Find the inverse Laplace transform of the following functions:

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

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:

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

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.