

Math 217 - November 8, 2010

$\mathcal{L}\{e^{at}\} = \frac{1}{s-a}$	$\mathcal{L}\{t^n\} = \frac{n!}{s^{n+1}}$
$\mathcal{L}\{t^a\} = \frac{\Gamma(a+1)}{s^{a+1}}$	$\mathcal{L}\{u_a(t)\} = \frac{e^{-sa}}{s}$
$\mathcal{L}\{\cosh(at)\} = \frac{s}{s^2-a^2}$	$\mathcal{L}\{\sinh(at)\} = \frac{a}{s^2-a^2}$
$\mathcal{L}\{\cos(at)\} = \frac{s}{s^2+a^2}$	$\mathcal{L}\{\sin(at)\} = \frac{a}{s^2+a^2}$
$\mathcal{L}\{f'(t)\} = sF(s) - f(0)$	$\mathcal{L}\{e^{at}f(t)\} = F(s-a)$
$\mathcal{L}\left\{\int_0^t f(u) du\right\} = \frac{1}{s}F(s)$	$\mathcal{L}^{-1}\left\{\frac{1}{s}F(s)\right\} = \int_0^t f(u) du$
$(f * g)(t) = \int_0^t f(u)g(t-u) du$	$\mathcal{L}\{(f * g)(t)\} = F(s)G(s)$
$\mathcal{L}\{-tf(t)\} = F'(s)$	$\mathcal{L}\{t^n f(t)\} = (-1)^n F^{(n)}(s)$
$\mathcal{L}\left\{\frac{1}{t}f(t)\right\} = \int_s^\infty F(u) du$	$\mathcal{L}^{-1}\{F(s)\} = t\mathcal{L}^{-1}\left\{\int_s^\infty F(u) du\right\}$

1.

$$\mathcal{L}^{-1}\left\{\frac{39}{(s+2)(s^2+9)}\right\} =$$

2.

$$\mathcal{L}^{-1}\left\{\frac{8s}{s^2+10s+9}\right\} =$$

3.

$$\mathcal{L}^{-1}\left\{\frac{8s}{s^2+10s+29}\right\} =$$

Lecture Problems

4. Use convolutions

(a) $(t) * (e^t) =$

(b) $\mathcal{L}^{-1}\left\{\frac{1}{s^2(s-1)}\right\} =$

(c) $\mathcal{L}^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\} =$

(d) $\mathcal{L}^{-1}\left\{\frac{1}{(s^2+a^2)^2}\right\} =$

5. Use $\mathcal{L}\{-tf(t)\} = F'(s)$:

(a)

$$\mathcal{L}\{t \sin at\} =$$

(b)

$$\mathcal{L}\{t^2 \sin at\} =$$

(c) Suppose $y(0) = 1$.

$$\mathcal{L}\{ty'\} =$$

(d) Suppose $y(0) = 1$ and $y'(0) = 2$.

$$\mathcal{L}\{ty''\} =$$

6. Use $\mathcal{L}\left\{\frac{f(t)}{t}\right\} = \int_s^\infty F(u) du$:

(a)

$$\mathcal{L}\left\{\frac{\sin t}{t}\right\} =$$

(b)

$$\mathcal{L}^{-1}\left\{\frac{2s}{(s^2+1)^2}\right\} =$$

7. Problems for home

(a) $(t) * (\sin t) =$

(b) $(\cos 2t) * (\sin 3t) =$