Homework#5 (Math 342)

(due Wed Nov 14)

Z: Advanced Engineering Mathematics , by D. G. Zill (6th Edition)

Note: Detail your work to receive full credit.

Sec. 4.2 (Z): 6, 34

Additional problems:

1) Apply the definition to find the Laplace transform of the following functions

(a)

$$f(t) = \begin{cases} 1 & \text{for} \quad 0 \le t \le 1 \\ 0 & \qquad\quad t > 1 \end{cases}$$

(b) $f(t) = \sin(3t)\cos(3t)$

(c) $f(t) = (1+t)^3$

(d) $f(t) = te^t$

(e) $f(t) = \sinh^2(3t)$

2) Use the table to find the inverse Laplace transform of the following functions

(a)

$$F(s) = \frac{1}{s+5}$$

(b)

$$F(s) = \frac{10s-3}{25-s^2}$$

3) Use the Laplace transform to solve the following initial value problems

(a)

$$y'' + 8y' + 15y = 0\,, \quad y(0) = 2\,, \quad y'(0) = -3$$

(b)

$$y'' + y = \cos(3t)\,, \quad y(0) = 1\,, \quad y'(0) = 0$$

(c)

$$y'' + 4y' + 3y = 1\,, \quad y(0) = 0\,, \quad y'(0) = 0$$

4) Use the formulas for derivatives to show that

(a)

$$\mathcal{L}\{t\cos(kt)\} = \frac{s^2 - k^2}{(s^2+k^2)^2}$$

(b)

$$\mathcal{L}\{t\sinh(kt)\} = \frac{2ks}{(s^2-k^2)^2}$$

5) Use the translation property to find the Laplace transform of

$$f(t) = e^{-t/2}\cos(2t - \pi/4)$$

6) Use the translation property to find the inverse Laplace transform of

$$F(s) = \frac{3s+5}{s^2-6s+25}$$