Mathematics 38
Exam II

Tufts UNIVERSITY

Differential Equations
October 22, 2007

1. (10 points) Compute $\mathscr{L}[e^{3t+2}]$ using the definition. *No credit by any other method*

2. (10 points) Rewrite $f(t) = \begin{cases} 4t+1 & t < 2 \\ 9 & 2 \le t < 3 \\ t^2 & t \ge 3 \end{cases}$ in unit step function notation.

3. (10 points) Find $1 * \sin 5t$.

4. (20 points) Find the Laplace transform of $f(t)$.

a. $f(t) = te^{5t} \sin 3t$.

b. $f(t) = \begin{cases} t^2 & t < 3 \\ 0 & t \ge 3 \end{cases}$.

5. (30 points) Find the inverse Laplace transform.

a. $\dfrac{s+3}{s^2+2s+5}$.

b. $\dfrac{1}{(s^2+9)^2}$.

c. $\dfrac{e^{-4s}}{(s+4)^2}$.

6. (20 points) Solve using the Laplace transform. *No credit by any other method.*

a. $x'' + 4x' + 4x = te^{-2t}, \qquad x(0) = 0, \quad x'(0) = 1.$

b. $(D^2 - 2D + 1)x = \begin{cases} 0 & t < 2 \\ t-2 & t \ge 2 \end{cases}, \qquad x(0) = x'(0) = 1.$

END OF EXAMINATION