



Mathematics 38
Exam II

Differential Equations
March 12, 2007

1. (10 points) Compute $\mathcal{L}[t]$ using the definition. *No credit by any other method*

2. (10 points) Rewrite $f(t) = \begin{cases} 2 & t < 1 \\ 0 & 1 \leq t < 2 \\ t & t \geq 2 \end{cases}$ in unit step function notation.

3. (10 points) Find $e^t * e^{2t}$ using the definition.

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

a. $f(t) = te^{3t} \cos 2t$.

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

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

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

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

c. $\frac{s + e^{-\pi s}}{s^2 + 1}$.

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

a. $(D^2 + 4)x = 4$, $x(0) = 0$, $x'(0) = 5$.

b. $(D + 1)x = \begin{cases} \sin t & t < \pi \\ -\sin t & t \geq \pi \end{cases}$, $x(0) = 1$.

END OF EXAMINATION