Math 34 Differential Equations Exam #2
April 8, 2005 SHOW ALL WORK

[16] 1.) Find the LaPlace transform of $g(t) = \begin{cases} e^t & t < 1 \\ 0 & 1 \leq t < 3 \\ 4 & t \geq 3 \end{cases}$

Answer :____

[16] 2.) Find the inverse LaPlace transform of $\frac{8}{s^2-3s-4}$

Answer : ____________________

[16] 3.) Use the LaPlace transform to solve the given initial value problem.

$$y''' = 2, \qquad y(0) = 0, \quad y'(0) = 9, \quad y''(0) = 0$$

Answer ____

[16] 4.) Use the definition and not the table to find the LaPlace transform of $f(t) = 4$. Show all steps including where you need to take limits.

Answer :____

[16] 5.) A mass of 30 kg stretches a spring 2m. The mass is acted on by an external force of $8cos(2t)$ The mass is pushed upward 3m above its equilibrium position, and then set in motion in the downward direction with a velocity of 4 m/sec. If the mass moves in a medium that imparts a viscous force of 10 N when the speed of the mass is 2 m/sec, formulate the initial value problem describing the motion of the mass.

Answer 5.) ____

6.) Circle T for True and F for False.

[4] 6a.) Suppose $\mathcal{L}(f)$ and $\mathcal{L}(g)$ exist. $\mathcal{L}(fg) = \mathcal{L}(f)\mathcal{L}(g)$

T F

[4] 6b.) Suppose $\mathcal{L}(f)$ and $\mathcal{L}(g)$ exist. $\mathcal{L}(f+g) = \mathcal{L}(f) + \mathcal{L}(g)$

T F

[4] 6c.) Initial conditions will NOT have a significant long term affect on the behavior of $u(t)$ if $u(t)$ is a solution to the initial value problem: $2u''(t)+3u'(t)+4u(t) = F(t)$, $u(t_0) = u_0$, $u'(t_0) = u_0'$.

T F

[4] 6d.) Initial conditions will NOT have a significant long term affect on the behavior of $u(t)$ if $u(t)$ is a solution to the initial value problem: $2u''(t) - 3u'(t) + 4u(t) = F(t)$. $u(t_0) = u_0$, $u'(t_0) = u_0'$'.

T F

[2] 6e.) If $3e^{r_1 t} + 4e^{r_2 t}$ is a solution to the initial value problem

$$mu''(t) + \gamma u'(t) + ku(t) = 0 \quad u(t_0) = u_0, \; u'(t_0) = u_0'$$

and ψ is a solution to the differential equation $mu''(t) + \gamma u'(t) + ku(t) = F_o cos(\omega t)$, then $3e^{r_1 t} + 4e^{r_2 t} + \psi$ is a solution to the initial value problem

$$mu''(t) + \gamma u'(t) + ku(t) = F_o cos(\omega t) \quad u(t_0) = u_0, \; u'(t_0) = u_0'$$

T F

[3] 6f.) If $c_1 e^{r_1 t} + c_2 e^{r_2 t}$ is a solution to the differential equation

$$mu''(t) + \gamma u'(t) + ku(t) = 0$$

and ψ is a solution to the differential equation $mu''(t) + \gamma u'(t) + ku(t) = F_o cos(\omega t)$, then $c_1 e^{r_1 t} + c_2 e^{r_2 t} + \psi$ is a solution to the differential equation

$$mu''(t) + \gamma u'(t) + ku(t) = F_o cos(\omega t)$$

T F

[2-4] 7.) If $u(t)$ is a solution to the initial value problem:

$$mu''(t) + \gamma u'(t) + ku(t) = F_o cos(\omega t), \; m, \; \gamma, \; k \geq 0, \quad u(t_0) = u_0, \quad u'(t_0) = u_0'$$

and $lim_{t \to \infty} |u(t)| = +\infty$, can you say anything about the values of m, γ, k, F_o, and ω.