MA 226 Section B – Exam 3a

Fall 2014

Question Number	Possible Points	Student Score
1	24	
2	12	
3	14	
4	10	
5	12	
6	12	
7	16	
Total Points	100	

You must show your work to receive full credit

Discussion Sections:

      B2: Wednesday 9-10

      B3: Wednesday 2-3

Name: _____   Discussion Section:_____

1.) Find the Inverse Laplace Transform of the following expressions:

a) $\mathcal{L}^{-1}\left[\dfrac{6}{s^2-1}\right] =$

(6 pts)

b) $\mathcal{L}^{-1}\left[\dfrac{2s}{s^3(s-1)}\right] =$

(8 pts)

Name: _____   Discussion Section:_____

1.) (continued) Find the inverse Laplace transform:

c) $\mathcal{L}^{-1}\left[\dfrac{s\cdot e^{-2s}}{s^2+9}\right]=$

(4 pts)

d) $\mathcal{L}^{-1}\left[\dfrac{(s+1)\cdot e^{-4s}}{s^2+6s+13}\right]=$

(6 pts)

2. (12 pts) Six second order equations and four $y(t)$ - graphs are given below. For each $y(t)$ - graph, determine the second-order equation for which $y(t)$ is a solution, and state briefly how you know your choice is correct.

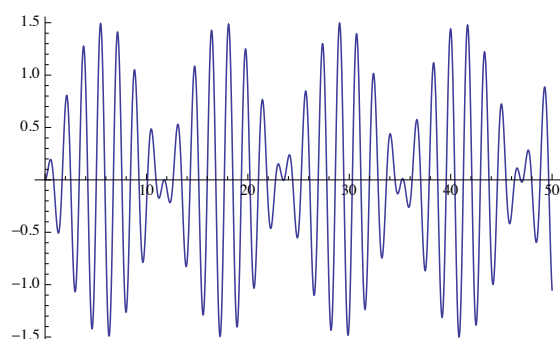(i) $\dfrac{d^2y}{dt^2} + 2\dfrac{dy}{dt} + 16y = 3\cos 4t$ (ii) $\dfrac{d^2y}{dt^2} + 12y = 3\cos 4t$ (iii) $\dfrac{d^2y}{dt^2} + 18y = 3\cos 4t$

(iv) $\dfrac{d^2y}{dt^2} + 16y = -8$ (v) $\dfrac{d^2y}{dt^2} + 16y = 3\cos 4t$ (vi) $\dfrac{d^2y}{dt^2} + 16y = 8$
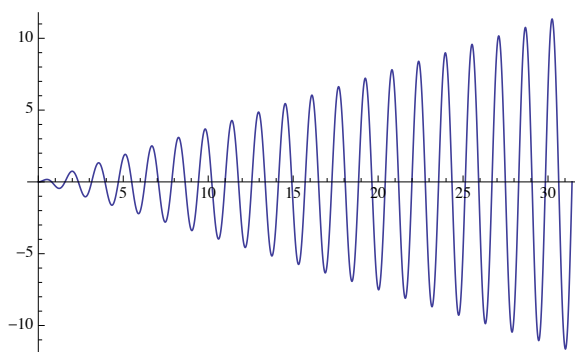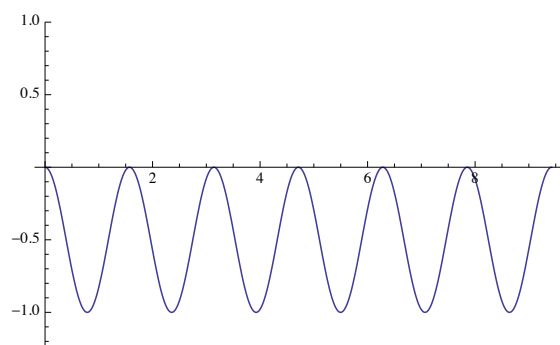
A

equation: _____
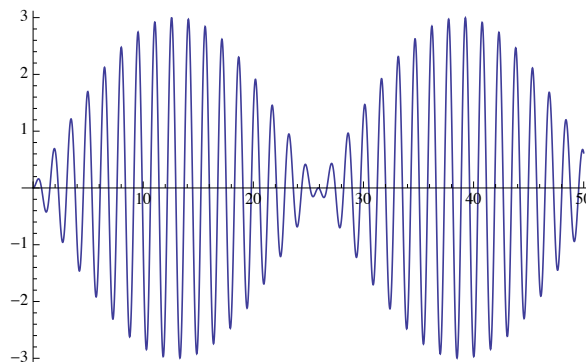
reason:

B

equation:_____

reason:

C

equation: _____

reason:

D

equation: _____

reason:

3. (14 pts) Find the general solution of : $\dfrac{d^2 y}{dt^2} + 3\dfrac{dy}{dt} + 2y = 4t^2 + 2 + e^{-2t}$

4. (10 pts) Compute the Laplace Transform of the function $w(t)$ using the definition of the Laplace Transform:

$$w(t) = \begin{cases} e^{-t}, & \text{if } 0 \le t < 1 \\ 3, & \text{if } t \ge 1 \end{cases}$$

5. (12 pts) Find a particular solution of $\dfrac{d^2y}{dt^2}+4\dfrac{dy}{dt}+13y=3\sin(2t)$ using complexification.

6. (12 pts) Given the nonlinear autonomous system

$$\frac{dx}{dt} = x(2 - x - y)$$

$$\frac{dy}{dt} = y(6 - 2x - y)$$

Use Linearization to classify the behavior at the equilibrium point $(4, -2)$. If the equilibrium point is a spiral source or a spiral sink determine the direction of rotation as clockwise or counter clockwise.

7. (16 pts) Solve the 2nd order linear non-homogeneous initial value problem:

(you can use the next page too if you need more space)

$$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 6y = 6u_3(t) \quad \text{with } y(0) = 2 \text{ and } y'(0) = 4$$