

Exam III Problems for Ma 221 2004 Fall.

1 Exam IIIA

1 (25 pts.) Use Laplace Transforms to solve

$$y'' + 2y' + 5y = 0 \quad y(0) = 1 \quad y'(0) = -3$$

2a (10 pts.) Use the definition of the Laplace transform to find $\mathcal{L}\{f(t)\}$ where

$$f(t) = \begin{cases} 0 & 0 \leq t < 4 \\ 2e^{-3t} & 4 \leq t < \infty \end{cases}$$

2b (15 pts.) Find $\mathcal{L}^{-1} \left\{ \frac{(s+5)(s+3)}{s(s+2)(s+6)} \right\}$.

3 (25 pts.) Find the first six non-zero terms in the series solution near $x = 0$ of the equation

$$y'' - xy = 0$$

Give the recurrence relation also.

4 (25 pts.) Find the eigenvalues and eigenfunctions for

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

Be sure to consider all values of λ .

2 Exam IIIB

1 (25 pts.) Use Laplace Transforms to solve

$$y'' - 2y' + 5y = 0 \quad y(0) = 2 \quad y'(0) = -5$$

2a (10 pts.) Use the definition of the Laplace transform to find $\mathcal{L}\{f(t)\}$ where

$$f(t) = \begin{cases} 0 & 0 \leq t < 2 \\ 4e^{3t} & 2 \leq t < \infty \end{cases}$$

2b (15 pts.) Find $\mathcal{L}^{-1}\left\{\frac{(s-5)(s-3)}{s(s-2)(s-6)}\right\}$.

3 (25 pts.) Find the first six non-zero terms in the series solution near $x = 0$ of the equation

$$y'' - x^2y = 0$$

Also give the recurrence relation.

4 (25 pts.) Find the eigenvalues and eigenfunctions for

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

Be sure to consider all values of λ .