

NAME: *Solutions*

NetID:

MATH 285 E1/F1 Exam 3 (B)

November 14, 2014

Instructor: Pascaleff

INSTRUCTIONS:

- Do all work on these sheets.
- Show all work.
- The exam is 50 minutes.
- Do not discuss this exam with anyone until after 3:00 pm on Nov. 14, 2014.

Problem	Possible	Actual
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

ORTHOGONALITY FORMULAS

$$\int_{-L}^L \cos \frac{m\pi t}{L} \cos \frac{n\pi t}{L} dt = \begin{cases} 0, & m \neq n \\ L, & m = n \end{cases} \quad (1)$$

$$\int_{-L}^L \sin \frac{m\pi t}{L} \sin \frac{n\pi t}{L} dt = \begin{cases} 0, & m \neq n \\ L, & m = n \end{cases} \quad (2)$$

$$\int_{-L}^L \cos \frac{m\pi t}{L} \sin \frac{n\pi t}{L} dt = 0 \quad (3)$$

SOME INTEGRAL FORMULAS

$$\int u \cos u du = u \sin u + \cos u + C \quad (4)$$

$$\int u \sin u du = -u \cos u + \sin u + C \quad (5)$$

1. (20 points) Find the general solution of the differential equation

$$y' - 5y = xe^{5x}$$

$$(D - 5)y = xe^{5x}$$

Annihilator of xe^{5x} is $(D - 5)^2$

Apply to both sides $(D - 5)^3 y = 0$

so try $y = Ae^{5x} + Bxe^{5x} + Cx^2e^{5x}$

$$y' = 5Ae^{5x} + B(e^{5x} + 5xe^{5x}) + C(2xe^{5x} + 5x^2e^{5x})$$

$$-5y = -5Ae^{5x} - 5Bxe^{5x} - 5Cx^2e^{5x}$$

$$\overbrace{y' - 5y} = Be^{5x} + 2Cxe^{5x}$$

Must match

So $A = \text{anything}$

$$B = 0$$

$$2C = 1 \Rightarrow C = \frac{1}{2}$$

general solution is

$$\boxed{y = Ae^{5x} + \frac{1}{2}x^2e^{5x}}$$

A any constant