

MST 352/652

Homework #2

Due Date: January 29, 2019

1 Problems for everyone

1. pg. 18, #2.1.1-2.1.4, #2.1.6
2. pg. 23, #2.2.1-2.2.6, #2.2.8, #2.2.9
3. pg. 30, #2.2.16, #2.2.17, #2.2.20
4. Consider the problem:

$$\frac{d^2u}{dx^2} + u = 0,$$

$$u(0) = 0 \text{ and } u(L) = 0,$$

where $L > 0$ is a constant and u is a function of a single variable x . Clearly, $u(x) = 0$ is a solution. Is this solution unique, or not?

5. Solve the boundary value problem

$$u''(x) = 0,$$

$$u'(0) + ku(0) = 0 \text{ and } u'(1) \pm ku(1) = 0,$$

where $k > 0$ is a constant and u is a function of one variable. Do the + and - cases separately. What is special about the case $k = 2$?

2 Graduate Problems

Undergraduate students can complete these exercises for extra credit

1. pg. 30, #2.2.19, #2.2.25
2. Consider the equation

$$u_t + xu_x = 0$$

with the boundary condition $u(t, 0) = \phi(t)$.

- (a) For $\phi(t) = t$, show that no solution exists.
- (b) For $\phi(t) = 1$, show that there are infinitely many solutions.