Math 3363 Graded Homework 1
Due February 3

Spring 2015

Papers are due at the beginning of class. Please write on only one side of each page of your paper and staple your pages.

1. Find the solution to
\[ u''(x) - x^2 = 0 \text{ for } 0 \leq x \leq 2, \]
\[ u(0) = 2, \text{ and} \]
\[ u'(2) = 1. \]

2. Let
\[ Q(x) = \beta x \text{ for } 0 \leq x \leq 1 \]
and let
\[ f(x) = x \text{ for } 0 \leq x \leq 1. \]

Part a: Find the value of \( \beta \) so that the following problem has an equilibrium solution.
\[ \frac{\partial w}{\partial t}(x,t) = \frac{\partial^2 w}{\partial x^2}(x,t) + Q(x) \text{ for } 0 \leq x \leq 1 \text{ and } t \geq 0, \]
\[ \frac{\partial w}{\partial x}(0,t) = 1 \text{ for } t \geq 0, \]
\[ \frac{\partial w}{\partial x}(1,t) = 2 \text{ for } t \geq 0, \text{ and} \]
\[ w(x,0) = f(x) \text{ for } 0 \leq x \leq 1. \]

Part b: Let \( u \) be the equilibrium solution and assume that
\[ \lim_{t \to \infty} w(x,t) = u(x) \text{ for } 0 \leq x \leq 1. \]

Find a formula for \( u(x) \) that does not contain any undetermined constants.