MATH 320, Spring 2013, Assignment 3

Due date: Friday, February 15

Name (printed): ______________________________

UW Student ID Number: ______________________________

Discussion Section: (circle)

Robin Prakash:	**301**	**302**	**303**	
Sowmya Acharya:	**304**	**306**	**307**	**308**
Raghvendra Chaubey:	**352**	**353**	**354**	**355**

Instructions

1. Fill out this cover page **completely** and affix it to the front of your submitted assignment.
2. **Staple** your assignment together and answer the questions in the order they appear on the assignment sheet.
3. Show all the work required to obtain your answers.
4. You are encouraged to collaborate on assignment problems but you must write up your assignment independently. **Copying is strictly forbidden!**

S#	Q#	Mark
1.6	10	/3
1.6	15	/3
1.6	23	/3
1.6	24	/3
1.6	35	/3
1.6	38	/3
1.6	56	/4
—	1	/3
—	2	/5
Total:		/30

Substitution Methods, (Power) Homogeneous, Bernoulli and Exact Differential Equations

Suggested problems:

Section 1.6: 1-28, 31-42, 55-62

Problems for submission:

Section 1.6: 10, 15, 23, 24, 35, 38, 56
(Justify your answers for full marks!)

1. Find the general solution of the differential equation

$$(2x^3 - y)\,dx + x\,dy = 0.$$

2. Assume that a population (denoted P) grows at a rate proportional to its own population when the population size is small (i.e. proportional to P) but encounters a second-power crowding term when the population is large (i.e. proportional to P^2). This gives rise to the *logistic growth model*

$$\frac{dP}{dt} = kP(M - P), \quad P(0) = P_0 \tag{1}$$

where $k, M > 0$ are non-negative constants.

(a) Treating the equation as a separable equation, show that the solution of (1) is given by

$$P(t) = \frac{MP_0}{P_0 + (M - P_0)e^{-kMt}}.$$

[**Hint:** See page 82 of the text]

(b) Show that (1) has the solution given in part (a) by treating the equation as a Bernoulli equation.