Math 1320 Spring 2016

Name:

Student ID #:

Practice Midterm Exam I.

5 problems are given. Show all the work and Justify your steps.

Problem	Points	Score
1	25	
2	25	
3	25	
4	25	
5	25	
	Total Score:	

Problem 1.

Using integration find the volume of:

- a) a sphere of radius r.
- b) a cap of a sphere with radius r and height h.
- c) a right circular cone with height h and base radius r.
- d) a pyramid with height h and rectangular base with dimensions a and 2a.

Problem 2.

a) If 6 J of work is needed to stretch a spring from 10 cm to 12 cm, and another 10 J is needed to stretch it from 12 cm to 14 cm, what is the natural length of the spring?

b) Coulomb's Law states that the electrical force between two charged objects is inversely proportional to the square of the distance between them.

$$F(r) = k \frac{q_1 q_2}{r^2}$$

Here, k is a constant, q_1 and q_2 are the respective charges of the two objects in Coulombs, and r is the distance between the two objects in meters. Calculate the work required to move the particles from a distance of 25 m apart to a distance of 5 m apart, with the answer given in terms of k, q_1 , and q_2 .

Problem 3.

a) Solve the separable differential equation

$$\frac{dy}{dx} = 2x \sec y \qquad y(1) = \frac{\pi}{2}$$

b) Solve the separable differential equation

$$\frac{dy}{dx} = 1 + x + y + xy$$
 $y(0) = 10$

Problem 4.

Determine whether the sequence converges or diverges. If it converges, find the limit.

a)

$$a_n = \frac{n^5}{n^5 + 3}$$

b)

$$a_n = \frac{1 - \cos^2 n}{7^n}$$

c)

$$a_n = \frac{(-1)^{n+1}n}{n^2 + 3}$$

Problem 5.

Find the values of x for which the series converges. Find the sum of the series for those values of x. a)

$$\sum_{n=1}^{\infty} \frac{(x+5)^n}{2^n}$$

b)

$$\sum_{n=0}^{\infty} \frac{\sin^n x}{2^n}$$