

Name:

PID:

Discussion Section - No:

Time:

TA's name:

Midterm 2, Math 10C - Lecture A (Winter 2007)

Duration: 50 minutes

Please close your books, turn your calculators off and put them away. You can use one page of notes. To get full credit you should support your answers.

1. Consider the function $z = f(x, y) = \sqrt{x + y}$.

a) (2 points) Plot the vertical cross-sections when y is fixed to -1 , 0 and 1 .

b) (3 points) Plot the contour diagrams. Describe how the contour diagrams are spaced in words.

#	Score
1	
2	
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4	
Total	

2. (5 points) You need to cross a river from the south shore moving straight to the north by a boat. The river flows due east at a constant speed of 3ft/s . You can row at a speed of 5ft/s in still water. If the river is 300 feet wide, how long does your trip from the south shore to the north shore last? (Hint: Determine the rowing speed to the west that ensures that you are moving straight to the north. This is the horizontal component of the rowing velocity. Now the vertical component of the rowing velocity can be determined using the fact that the magnitude of the rowing velocity is 5.)

3. There is a unique plane P in 3-space containing the points $p = (1, 0, 1)$, $s = (2, 2, 2)$ and $r = (-2, -2, -2)$.

a)(1 point) Find two vectors that are contained on the plane P .

b)(2 points) Find the normal vector \vec{n} to the plane P that is perpendicular to both of the vectors that you determined in part **a**).

c)(2 points) Find the equation for the plane P .

4. The gravitational force exerted by the earth on an object of mass m kilograms that is h meters away from the center of the earth is

$$F_g(m, h) = \frac{GMm}{h^2} \text{ newtons}$$

where M denotes the mass of the earth in kilograms and G is the positive gravitational constant.

a)(2 points) Without calculating the partial derivatives determine the signs of the partial derivatives $\frac{\partial F_g}{\partial m}$ and $\frac{\partial F_g}{\partial h}$. Your answer should be based on whether F_g is an increasing function of m (when h is fixed) and h (when m is fixed).

b)(3 points) Calculate the partial derivatives $\frac{\partial F_g}{\partial m}$ and $\frac{\partial F_g}{\partial h}$.