SM 221, Section 5024, Spring 2012, Practice *for* Exam 1.

Mrinal Raghupathi

The exam will have have two parts. On the first part calculators are not allowed. On the second part calculators are permitted. The problems listed in the free response are from the book. On the actual exam several problems from different sections will be combined into a single question.

Part 1 has two sections. Section 1 is multiple choice, section 2 is free response.

Part 2 has only free response problem(s)

Disclaimer and warranty

The exam is provided as is, no claim is made as to its usefulness, or correctness. There is no warranty, all sales are final.

Part 1

Multiple choice

1. Consider the parametric curve $x(t) = t$, $y(t) = \sin(2\pi t)$, $z(t) = \cos(2\pi t)$. This curve traces out a helix. Which of the following integrals gives the arc-length of the curve as it traces out one revolution.

   (a) $\int_0^1 t + \sin(t) + \cos(t)\, dt$
   (b) $\int_0^{2\pi} \sqrt{t^2+1}\, dt$
   (c) $\int_0^1 \sqrt{1+4\pi^2}\, dt$
   (d) $\int_0^{2\pi} \sqrt{2}\, dt$
   (e) $\int_0^{2\pi} \sqrt{t^4+1}\, dt$
   (f) None of the above

2. Which of the following is the equation of the plane that is tangent to the surface $z^2 - x^2 + y^2 = 0$.

   (a) $x - y - z = 1$
   (b) $x + y + z = 1$
   (c) $x - z = -1$
   (d) $x + y - z = 3$

(e) $x - y - z = -1$

(f) None of the above

3. The point $(1, 1)$ is a minimum for the function f. Which of the following could be true.

   (a) $f_{xx}(1,1) = 2,\ f_{yy}(1,1) = 3,\ f_{xy}(1,1) = 2$

   (b) $f_{xx}(1,1) = 3,\ f_{yy}(1,1) = 3,\ f_{xy}(1,1) = 2$

   (c) $f_{xx}(1,1) = -3,\ f_{yy}(1,1) = -4,\ f_{xy}(1,1) = 2$

   (d) $f_{xx}(1,1) = -3,\ f_{yy}(1,1) = 1,\ f_{xy}(1,1) = 2$

   (e) $f_{xx}(1,1) = 3,\ f_{yy}(1,1) = 2,\ f_{xy}(1,1) = 2$

4. The gradient of a function $f(x, y)$ at the point $(1, 1)$ is $\langle 4, -3\rangle$. The unit vector in the direction in which f is increasing most rapidly is

   (a) $\langle 4, -3\rangle$

   (b) $\frac{1}{5}\langle 4, -3\rangle$

   (c) $\frac{1}{25}\langle 4, -3\rangle$

   (d) $\frac{1}{5}\langle 4, -3\rangle$

   (e) $-\frac{1}{5}\langle 4, -3\rangle$

Free response

Open the book and do the following problems:

chapter	problem
16.2	10
14.1	46
14.3	10, 52
14.4	3, 18
14.6	16, 27, 38, 41
14.7	3, 7

Part 2

Do problem 24 in chapter 13.4