

Name _____ Student number _____

MATH 226 SAMPLE MIDTERM 1

Fall 2014

This examination booklet contains 6 problems on 5 sheets of paper including the front cover. Do all of your work in this booklet and show all your calculations (you may use the back of the page if you need more space). This is a closed book exam. No books, notes, calculators, or other aids are allowed.

1. (6 marks) Let $f(x, y) = \sqrt{y - x^2}$. Find the domain of f , and draw several level curves.

2. (4 marks) Decide whether each of the sets below is open, closed, or neither. **For this problem only**, a correct answer with no explanation will be sufficient for full credit.

(a) $\{(x, y) \in \mathbb{R}^2 : 0 \leq x < 1, 0 \leq y < 2\}$,

(b) $\{(x, y) \in \mathbb{R}^2 : x + y < 2\}$.

3. (6 marks) Find the area of the triangle in \mathbb{R}^3 with vertices $(1, 0, 0)$, $(4, 0, 1)$, $(1, 2, -1)$.

4. (6 marks) Find the scalar parametric equations of the line which passes through the point $(4, 5, -2)$ and is perpendicular to the plane through the three points $(1, 0, 1)$, $(3, 2, 0)$, $(-1, 1, 2)$.

5. Let

$$f(x, y) = \begin{cases} \frac{x^3 + xy - y^3}{x^2 + y^2} & \text{if } (x, y) \neq (0, 0) \\ 0 & \text{if } (x, y) = (0, 0) \end{cases}$$

(a) (6 marks) Find $\frac{\partial f}{\partial x}(0, 0)$ and $\frac{\partial f}{\partial y}(0, 0)$.

(b) (6 marks) Does f have a limit at $(0, 0)$? Explain your answer. (The explanation is the main point here. You will get at most 1 mark for the correct answer with no proof.)

6. (6 marks) Find all values of (a, b) such that the tangent plane to the surface $z = 4x^2 - y^2$ at $(a, b, 4a^2 - b^2)$ is parallel to the line with parametric equations $x = t + 1$, $y = 2t$, $z = -4t + 9$.

Problem	Possible score	Your score
1	6	
2	4	
3	6	
4	6	
5	12	
6	6	
Total	40	