MATH 234 QUIZ 3 29 SEPT 2016, TA: JIUYA WANG

Name:

Notice:
1. Please box your final answer.
2. Please stop writing when time is up.

Problem 1 (10 points):
Consider the quadratic form

$$f(x,y) = \frac{1}{2}x^2 - xy + y^2$$

1. Classify the quadratic form by completing the square;
2. Classify the quadratic form by $4AC - B^2$;
3. Determine the zero set of this quadratic form;

1. $\frac{1}{2}x^2 - xy + y^2 = \frac{1}{2}\cdot[x^2 - 2xy + 2y^2] = \frac{1}{2}[x^2 - 2xy + y^2 - y^2 + 2y^2]$

$= \frac{1}{2}[(x-y)^2 + y^2] = \frac{1}{2}(x-y)^2 + \frac{1}{2}y^2$

positive definite

2. $4AC - B^2 = 4\cdot\frac{1}{2}\cdot 1 - (-1)^2 = 1 > 0 \qquad A = \frac{1}{2} > 0$

positive definite

3. $x - y = 0$ and $y = 0 \Rightarrow \qquad x = y = 0$

Problem 2 (10 points):
Consider the function:

$$f(x,y) = \sqrt{x^2 + 2xy - 3y^2}$$

What is the largest domain for this function? Draw the domain on x-y plane.

1. $\sqrt{x^2 + 2xy - 3y^2}$ has domain. $x^2 + 2xy - 3y^2 \geq 0$

2. $x^2 + 2xy - 3y^2 = (x+y)^2 - (2y)^2 = (x+y+2y)(x+y-2y) \geq 0$