

## Math 105 Assignment 8

Due the week of March 14

1. A farmer grows

$$f(x, y) = 200\sqrt{6x^2 + y^2}$$

units of produce by utilizing  $x$  units of labor and  $y$  units of capital. He currently employs 10 units of labor and invests 5 units of capital. Estimate the change in production if he decides to invest a unit more of the capital but also decreases his labor by half a unit.

(4 points)

2. For the function

$$f(x, y) = \ln(1 + xy),$$

find the unit vector that gives the direction of steepest descent at the point  $P(2, 3)$ . Also find the direction of no change at this point.

(2+2 = 4 points)

3. A monopolist markets a product in Canada and the UK and can charge different amounts in each country. Let  $x$  be the number of units to be sold in Canada and  $y$  the number of units to be sold in the UK. Due to the laws of demand and in order to sell all the units, the monopolist must set the unit price at  $97 - (x/10)$  dollars in Canada and  $83 - (y/20)$  dollars in the UK. The cost of production is \$3 per unit, in addition to a base capital of \$20,000. If the monopolist intends to maximize profit, how many units should he aim to sell in each country?

(7 points)