

Your name:

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**Math 11 Fall 2015, Homework 3, due Wed Oct 7**

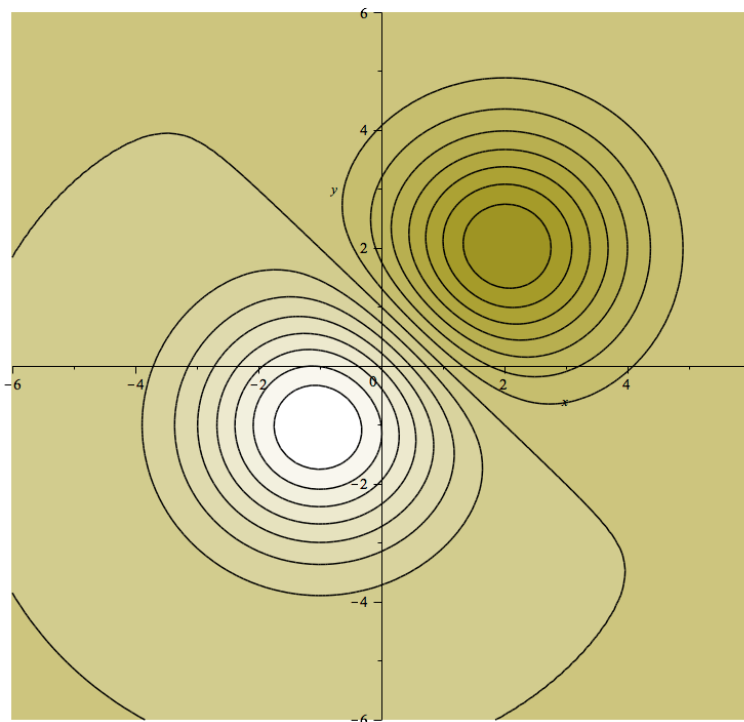
*Please show your work. No credit is given for solutions without work or justification.*

(1) Compute the limit or prove that it does not exist.

(a)  $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 + \sin^2(y)}{2x^2 + y^2}$

(b)  $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 + x^3 + y^2}{x^2 + y^2}$

- (2) Consider the following contour map for  $f(x, y)$ , in which the white regions represent larger  $z$ -values and the yellow regions represent smaller  $z$ -values.



Answer the following questions about the sign (positive or negative) of various quantities. **If there is not enough information to answer a question, state “Not enough information.”**

- (a) What is the sign of  $f(0, 0)$ ?
- (b) What is the sign of  $f_x(1, 2)$ ?
- (c) What is the sign of  $f_y(0, 1)$ ?
- (d) What is the sign of  $f_{yy}(0, -1)$ ?

(3) Answer the following questions.

(a) Find the equation of the tangent plane to  $f(x, y) = \sqrt{x^2 + y^2}$  at  $(x, y) = (3, 4)$ .

(b) Use your answer to part (a) to estimate the value of  $f(2.98, 4.01)$  without using a calculator.