

# SAMPLE

## MATH 116-02 QUIZ 6

Surname\ Name:

ID:

**Problem.** Use Taylor's formula for  $f(x, y)$  at the origin to find the quadratic approximation of

$$f(x, y) = e^x \cos y$$

near the origin.

**Solution.**

We have,

$$f(x, y) \approx f(0, 0) + f_x(0, 0)x + f_y(0, 0)y + \frac{1}{2!} (f_{xx}(0, 0)x^2 + 2f_{xy}(0, 0)xy + f_{yy}(0, 0)y^2)$$

Since  $f(0, 0) = 1$

$$f_x = e^x \cos y, \quad f_x(0, 0) = 1,$$

$$f_y = -e^x \sin y, \quad f_y(0, 0) = 0,$$

$$f_{xx} = e^x \cos y, \quad f_{xx}(0, 0) = 1,$$

$$f_{xy} = -e^x \sin y, \quad f_{xy}(0, 0) = 0,$$

$$f_{yy} = -e^x \cos y, \quad f_{yy}(0, 0) = -1,$$

then

$$f(x, y) \approx 1 + x + \frac{1}{2!}(x^2 - y^2).$$

Thus, the quadratic approximation of  $f(x, y)$  near  $(0, 0)$  is

$$1 + x + \frac{x^2}{2} - \frac{y^2}{2}.$$