

Date: Sep 18, 2009

## MA3160-04 Quiz 2

No Calculators! Justify all answers!

Name(print):

Solutions

1. (5pts.) Find the equation of the linear function  $z = mx + ny + c$  whose graph contains the points  $(-1, 0, 1)$ ,  $(0, 1, -1)$ ,  $(0, 0, 1)$ .

The three points must satisfy the equation  $z = mx + ny + c$

$$P_3 = (0, 0, 1) : 1 = 0 + 0 + c \implies c = 1$$

$$P_2 = (0, 1, -1) : -1 = 0 + n + 1 \implies n = -2$$

$$P_1 = (-1, 0, 1) : 1 = -m + 0 + 1 \implies m = 0$$

Therefore, the equation of the linear function is

$$z = -2y + 1$$

2. (5pts.) Find a function  $f(x, y, z)$  whose level surface  $f = 1$  is the graph of the function  $g(x, y) = xy + e^{xy} + 1$ .

Let  $f(x, y, z) = g(x, y) - z + 1$ . Then the level surface  $f(x, y, z) = 1$  is  $g(x, y) - z + 1 = 1$  which implies  $z = g(x, y)$ . This shows that the desired function is,

$$f(x, y, z) = g(x, y) - z + 1 = xy + e^{xy} - z + 2$$

or, alternatively,

$$f(x, y, z) = z - g(x, y) + 1 = z - xy - e^{xy}$$