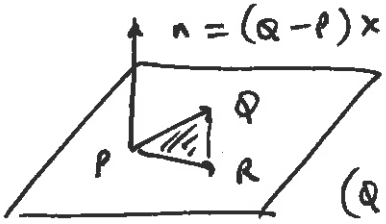
MATH 2850
Quiz 2
September 23, 2016 NAME. SOLUTION

1. Let $P = (1,1,1)$, $Q = (2,3,4)$ and $R = (3,4,7)$ be given three points in $\mathbf{R}^3$.

a. Compute the area of the triangle with vertices P, Q and R.



$n = (Q-P) \times (R-P)$

$Q - P = (2,3,4) - (1,1,1) = (1,2,3)$

$R - P = (3,4,7) - (1,1,1) = (2,3,6)$

$$(Q-P)\times(R-P) = \begin{vmatrix} i & j & k \\ 1 & 2 & 3 \\ 2 & 3 & 6 \end{vmatrix} = (3,0,-1)$$

area of $\Delta = \frac{1}{2}\|(3,0,-1)\| = \frac{1}{2}\sqrt{9+0+1} = \frac{\sqrt{10}}{2}$.

b. Find a closed (non-parametric) coordinate equation for the plane Π passing through P, Q and R.

$n = (3,0,-1)$, point $(1,1,1)$ [OR $(2,3,4)$, OR $(3,4,7)$].

$(n - P) \cdot (3,0,-1) = 0$

$(x-1, y-1, z-1) \cdot (3,0,-1) = 0 \Rightarrow 3x - z = 2$.

2. Let $f(x,y) = 2 - (x^2 + y^2)$.

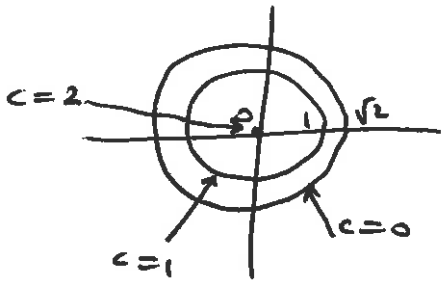
a. Determine the level sets for the function f for the values $c = 0,1,2,3$. Make sure to indicate the height c of each curve.

$c = f(x,y) = 2 - (x^2+y^2)$

$x^2 + y^2 = 2 - c$ Level set at height c is a circle of radius $\sqrt{2-c}$ if $c < 2$

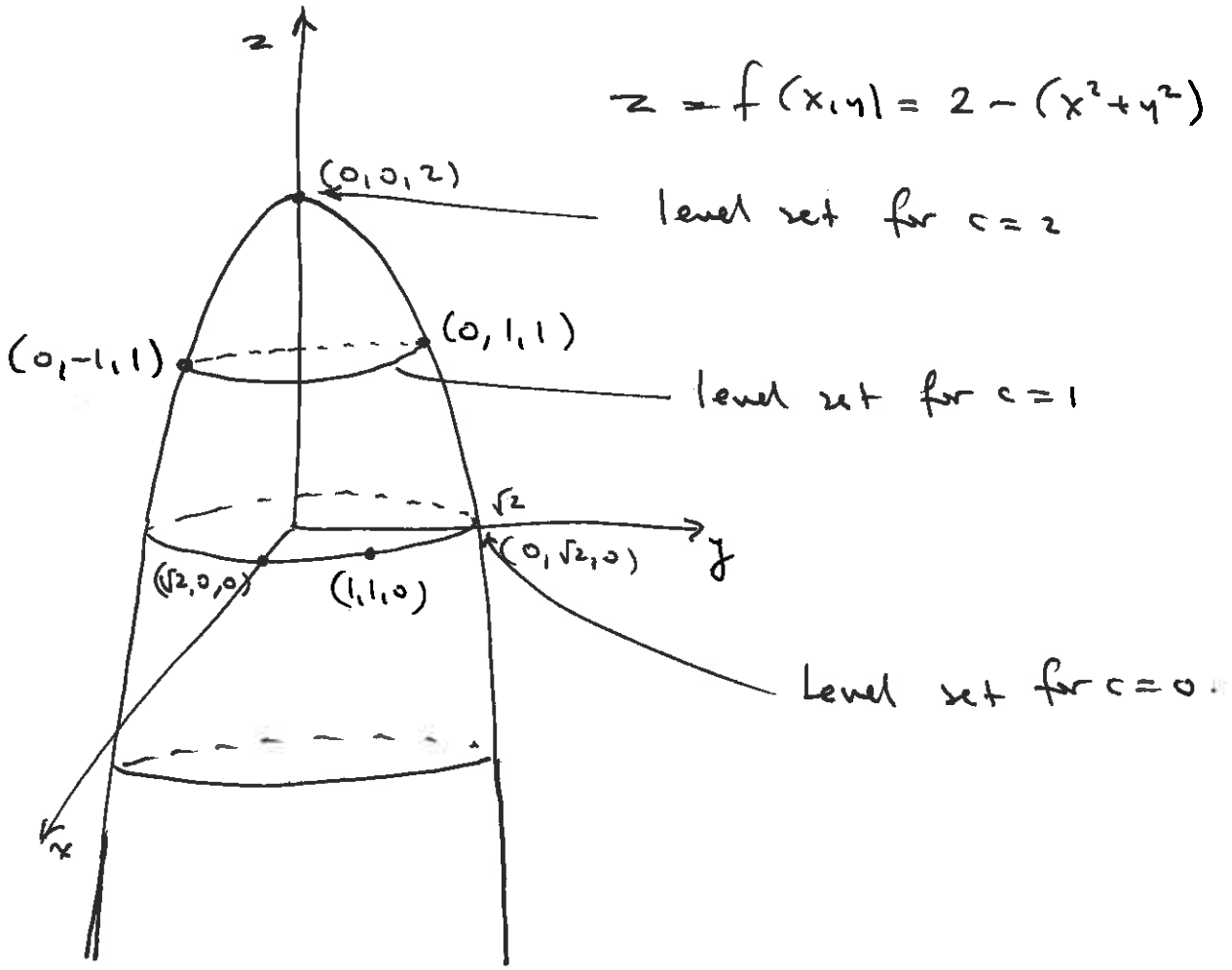
$c = 2$ yields a point

$c = 3$ has no solution, level set $= \emptyset$.



b. Use the information obtained in part (**a**) to sketch the graph of f on the back of the page. Show at least 3 points on this graph withh all coordinates.

PTO


z
$z = f(x,y) = 2 - (x^2+y^2)$
(0,0,2)
level set for c = 2
(0,-1,1)
(0,1,1)
level set for c = 1
√2
(0,√2,0)
y
(√2,0,0)
(1,1,0)
Level set for c = 0.
x