Instr.: Woei | *May 18, 2006*

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No Calculators.
Show all work and justifications to receive full credit.

1. (*4 pts*) Find the angle between the two planes $8x + 8y + 8z = 8$ and $4x - 11y + 6z = -9$. You do not need to simplify your answer.

To find the angle between two planes is equivalent to finding the angle between the normals to the plane. $\langle 8,8,8\rangle$ or $\langle 1,1,1\rangle = n_1$ is the normal to the plane $8x+8y+8z=8$ & $\langle 4,-11,6\rangle = n_2$ is the normal to the plane $4x-11y+6=-9$.

Thus $\cos\theta = \dfrac{n_1 \cdot n_2}{\|n_1\|\,\|n_2\|} = \dfrac{-1}{\sqrt{3}\sqrt{173}} = \dfrac{-1}{\sqrt{519}} \Rightarrow$

$\theta = \cos^{-1}\left(\dfrac{-1}{\sqrt{519}}\right)$

2. (*4 pts*) Find the domain and range of $f(x,y) = \frac{1}{\sqrt{8-x^2-y^2}}$.

The domain $(f) = \{(x,y) \mid 8-x^2-y^2 > 0\} = \{(x,y) \mid x^2+y^2 < 8\}$ = points in the circle of radius $\sqrt{8}$ centered at the origin

range $(f) = [\frac{1}{\sqrt{8}}, \infty)$ since the largest $8-x^2-y^2$ is 8 & smallest is close to 0.

3. (*2 pts*) Describe the level curve $1 = z = f(x,y)$ where $f(x,y)$ is defined in problem 2.

$1 = \dfrac{1}{\sqrt{8-x^2-y^2}} \Rightarrow \sqrt{8-x^2-y^2} = 1 \Rightarrow 8-x^2-y^2 = 1 \Rightarrow$

$x^2+y^2 = 7$ which is a circle of radius $\sqrt{7}$ centered at the origin.