Math 233 FALL 2004

Solutions to HWK#1

1) The closest points on the xy , yz & xz planes , respectively , to the point (3 , 7 , -5) are the points (3,7,0) , (0,7, -5) & (3, 0 , -5) , respectively . Hence we get a) 5 , b) 3 and c) 7 .
Similarly we can find the closest points to (3,7, -5) on the x-axis , y-axis & z-axis , respectively . They are (3,0,0) , (0,7,0) & (0,0, -5) . We then get that
d) $\sqrt{49+25} = \sqrt{74}$, e) $\sqrt{9+25} = \sqrt{34}$, f) $\sqrt{9+49} = \sqrt{58}$.

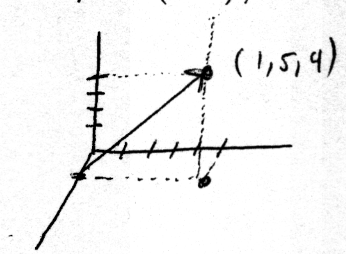
2) We can divide by 3 and get $x^2 + y^2 + \frac{2}{3}y + z^2 - \frac{2}{3}z = 3$.
This can be rewritten as $x^2 + (y+\frac{1}{3})^2 + (z-\frac{1}{3})^2 = 3 + \frac{1}{9} + \frac{1}{9} = \frac{29}{9}$.
Then center is $(0 , -\frac{1}{3} , \frac{1}{3})$ and radius is $\frac{\sqrt{29}}{3}$.

3) A plane perpendicular to the z-axis just means it is a plane parallel to the xy-plane or has formula z = c . Since (1,1,3) is on this plane , the plane must be z = 3 .
The sphere in question is $x^2 + y^2 + z^2 = 25$. The intersection of the plane and the sphere gives $x^2 + y^2 + 9 = 25$ Or $x^2 + y^2 = 16$.
Conclusion : We have circle of radius 4 with center (0,0,3) lying on plane z = 3 .

or $\{ (x,y,z) \ / \ x^2 + y^2 = 16 \ and \ z = 3 \}$.

4) a) $\overrightarrow{AB} = < 2-1, 3-(-2), 4-0. = < 1,5,4 >$.

b)



5) Given **a** = < 3 , 0 , -2 > and **b** = < 1 , -1 , 1 > then :

| **a** | = $\sqrt{13}$, **a** + **b** = < 4 , -1 , -1 > , **a** - **b** = < 2 ,1, -3 > , 2**a** = < 6 ,0 , -4 >,
3 **a** + 2 **b** = < 11 , -2 , -4 > .

6) | **a** | = $\sqrt{81+4+36} = 11$ *and* **a** = $11 (\frac{9}{11} i - \frac{2}{11} j + \frac{6}{11} k)$.
Note : $< \frac{9}{11} , -\frac{2}{11} , \frac{6}{11} >$ *is unit vector* in the direction of **a** .