Spring 2004 Math 267

Review Sheet 1 - Answers

1. Isosceles.
2. $(x-2)^2+y^2+(z+5)^2=\frac{1}{9}$
3. $C(-\frac{1}{2},-1,3)$, $R=\frac{7}{2}$
4. a. A plane perpendicular to the y-axis and passes through $y=8$

   b. The first-, second-, third-, and fourth-octants excluding the xy-plane

   c. The exterior of an open ball centered at the origin with radius 5

   d. $\{xy$ plane$\}$ together with $\{yz$ plane$\}$

   e. Solid cylinder with radius $\sqrt{8}$ whose axis of rotation is the z-axis
5. $\mathbf{a}-\mathbf{b}=\langle -1,5,2\rangle$, $\mathbf{a}+\mathbf{b}=\langle 3,5,12\rangle$, and $2\mathbf{a}-\frac{1}{2}\mathbf{b}=\langle 1,10,\frac{23}{2}\rangle$.
6. $\langle -\frac{3}{\sqrt{98}},\frac{8}{\sqrt{98}},\frac{5}{\sqrt{98}}\rangle$
7. $\theta=\cos^{-1}(10/\sqrt{338})$
8. $\alpha=\cos^{-1}(3/\sqrt{50})$
9. $x=2,\ -3$
10. $\langle 6,0,-12\rangle$
11. $\pm\langle \frac{\sqrt{6}}{6},-\frac{\sqrt{6}}{6},-\frac{\sqrt{6}}{3}\rangle$
12. $\langle 8,4,4\rangle$, Area $=2\sqrt{6}$.
13. 19 units^3
14. $x(t)=t+1$, $y(t)=-3t+2$, and $z(t)=t+4$. The symmetric equations are
$$x-1=\frac{2-y}{3}=z-4.$$
15. $x(t)=5+2t$, $y(t)=1-t$, $z(t)=t$. Point of intersection is $(7,0,1)$.
16. Skew
17. $3x+y+z=5$
18. $7x-5y-4z=6$
19. $x+3y+4z=34$
20. $y+z=1$
21. $\vec{r}(t)=\langle 4,1+6t,3t\rangle$
22. $\theta=45^o$
23. (1,0,0)
24. $\langle \frac{\sqrt{6}}{6},\frac{\sqrt{6}}{3},\frac{\sqrt{6}}{6}\rangle$
25. $x(t)=1+2t$, $y(t)=1+t$, $z(t)=1-t$
26. $\vec{r}(t)=\langle -\cos(t)+2,-\sin(t)+1,t^2+2\rangle$
27. $\theta=\cos^{-1}(1/\sqrt{6})$
28. Look at the traces by setting each variable to a constant and piece them together from that information.
29. $x+y^2+z^2=1$
30. $\frac{44\sqrt{22}-16}{27}$
31. See notes and the examples in your book.
32. a.)
$f_x(x,y)=2xy^3-8x^3$
$f_y(x,y)=3(xy)^2+2y$
$f_{xx}(x,y)=2y^3-24x^2$
$f_{yy}(x,y)=6yx^2+2$
$f_{xy}(x,y)=6xy^2$

b.)
$g_x(x,y)=3x^2\ln(x-y)+\frac{x^3}{x-y}$
$g_y(x,y)=\frac{x^3}{y-x}$
$g_{xx}(x,y)=6x\ln(x-y)+\frac{x^2(5x-6y)}{(x-y)^2}$
$g_{yy}(x,y)=-\frac{x^3}{(x-y)^2}$
$g_{xy}(x,y)=\frac{x^2(3y-2x)}{(x-y)^2}$

c.)
$h_x(x,y,z)=e^y\cos z$
$h_y(x,y,z)=xe^y\cos z$
$h_z(x,y,z)=-xe^y\sin z$
$h_{xx}(x,y,z)=0$
$h_{yy}(x,y,z)=xe^y\cos z$
$h_{zz}(x,y,z)=-xe^ycosz$
$h_{xy}(x,y,z)=e^y\cos z$
$h_{xz}(x,y,z)=-e^y\sin z$
$h_{yz}(x,y,z)=-xe^y\sin z$

d.)
$k_x(x,y)=ye^{xy}$
$k_y(x,y)=xe^{xy}$
$k_{xx}(x,y)=y^2e^{xy}$
$k_{yy}(x,y)=x^2e^{xy}$
$k_{xy}(x,y)=(yx+1)e^{xy}$