Homework 5
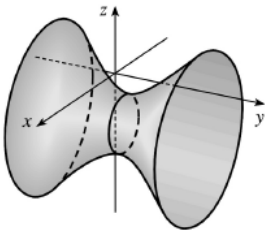
Chapter12.6. :36

36. Completing squares in all three variables gives $(x-1)^2-(y-1)^2+(z+2)^2=2$ or

$\dfrac{(x-1)^2}{2}-\dfrac{(y-1)^2}{2}+\dfrac{(z+2)^2}{2}=1$, a hyperboloid of one sheet with center $(1,1,-2)$ and axis the horizontal line $x=1$, $z=-2$.

Chapter13.2. :49

49. $\dfrac{d}{dt}\,|r(t)|=\dfrac{d}{dt}\,[r(t)\cdot r(t)]^{1/2}=\dfrac{1}{2}\,[r(t)\cdot r(t)]^{-1/2}\Big[2r(t)\cdot r'(t)\Big]=\dfrac{1}{|r(t)|}\,r(t)\cdot r'(t)$

Chapter 13.4. : 21

21. $|F(t)|=20$ N in the direction of the positive z –axis, so $F(t)=20\,k$. Also $m=4$ kg, $r(0)=0$ and $v(0)=i-j$. Since $20k=F(t)=4\,a(t)$, $a(t)=5\,k$. Then $v(t)=5t\,k+c_1$ where $c_1=i-j$ so $v(t)=i-j+5t\,k$ and the speed is $|v(t)|=\sqrt{1+1+25t^2}=\sqrt{25t^2+2}$. Also $r(t)=t\,i-t\,j+\dfrac{5}{2}\,t^2\,k+c_2$ and $0=r(0)$, so $c_2=0$ and $r(t)=t\,i-t\,j+\dfrac{5}{2}\,t^2\,k$.