Calculus III - MATH 2210 FA2021

1 Week 1

Equation for a sphere: $(x-h)^2+(y-j)^2+(z-k)^2=r^2$
Midpoint: $m_x=\frac{x_1-x_2}{2}$
Magnitude: $|u|=\sqrt{u_1^2+u_2^2+u_3^2}$
Projection of U onto V:
$pr_v u=(\frac{u\cdot v}{||v||})$
$u\times v=<u_2v_3-u_3v_2,u_3v_1-u_1v_3,u_1v_2-u_2v_1>$

2 Week 2

$a_t=T\cdot a$
$a_n=\sqrt{||r''(t)||^2-a_t^2}$
$A_t=a_tT(t)+a_nN(t)$
$T(t)=\frac{1}{||r'(t)||}\cdot r'(t)$
$N(t)=\frac{1}{||T'(t)||}\cdot T'(t)$
$K(t)=\frac{||r'(t)\times r''(t)||}{||r'(t)||^3}$
$B(t)=T(t)\times N(t)$

3 Week 3

3.1 Cartesian »Cylindrical

$r=\sqrt{x^2+y^2}$
$\theta=\arctan(\frac{y}{x})$
$z=z$

3.2 Cartesian »Spherical

$r=\sqrt{x^2+y^2+z^2}$
$\theta=\arctan(\frac{y}{x})$
$\varphi=\arccos(\frac{z}{r})$

3.3 Cylindrical »Cartesian

$x=r\cos\theta$
$y=r\sin\theta$
$z=z$

3.4 Spherical »Cylindrical

$P=r\sin\theta$
$\theta=\theta$
$z=\cos\theta$

Spherical »Cartesian

$x=r\sin\phi\cos\theta$
$y=r\sin\phi\sin\theta$
$z=r\cos\phi$

Examples

0.1

Let L be determined by the equations $y=2$ and $x=6z$. If we rotate around the X axis, we get an equation
$Ax^2+By^2+Cz^2=1$, find A, B, and C.
$y^2+z^2=2^2$
$\frac{1}{4}y^2+\frac{1}{4}z^2=1(B,C)$
Find a second point, this case it will be $<6,2,1>$
$A(6)^2+\frac{1}{4}(2)^2+\frac{1}{4}(1)^2=1$
$A(6)^2+\frac{1}{4}(1)^2=0$
$A36=-\frac{1}{4}$
$A=-\frac{1}{4*36}$

0.2

Find an equation of the ellipsoid passing through the points $(\pm3,0,0),(0,\pm1,0),(0,0,\pm6)$
Use formula of ellipsoid: $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}$, with $a=\pm3,b=\pm1,c=\pm6$