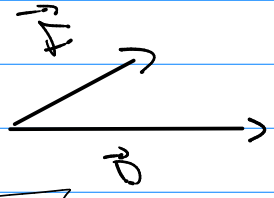
Math 344

Q's!

$\text{work} = \vec{F} \cdot \vec{D}$

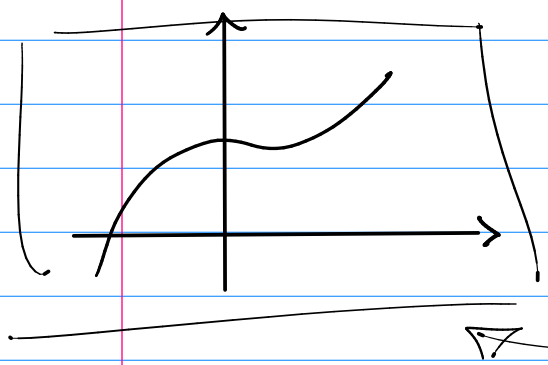


$|\text{work}| = |\vec{F}||\vec{D}|\cos\theta$

$\theta = ?$

Recognize 3D objects?

like 2D we should be able to...



polynomial $\&$ x^3

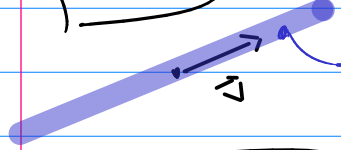
$f(x) = ax^3 + bx^2 + cx + d$

3D **Sphere** $(x-h)^2 + (y-k)^2 + (z-l)^2 = r^2$

line $\vec{r} = \vec{r}_0 + t\vec{v}$, $\quad x = x_0 + at$, $\quad \frac{x-x_0}{a} = \frac{y-y_0}{b} = \frac{z-z_0}{c}$

$y = y_0 + bt$

$z = z_0 + ct$

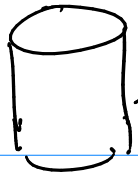


segment $\vec{r} = (1-t)\vec{r}_0 + t\vec{r}_1$

plane $\vec{n} \cdot (\vec{r} - \vec{r}_0) = 0$

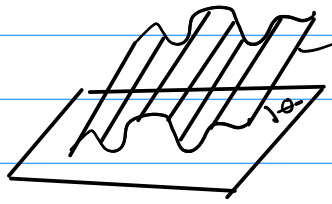
$\rightarrow a(x-x_0) + b(y-y_0) + c(z-z_0) = 0$

Cylinder



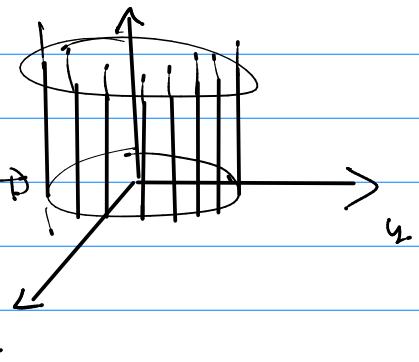
right circular cylinder

"Curtain"



all the lines (rulings) parallel to a given line passing through a given plane curve.

Ex $x^2 + y^2 = 4$

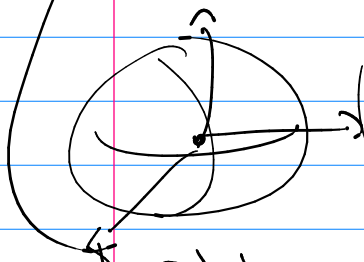


Quadrics

2D → quadratic $f(x) = ax^2 + bx + c$

3D x, y, z

$$Ax^2 + By^2 + Cz^2 + Dxy + Eyz + Fxz + Gx + Hy + Iz + J = 0$$



$x^2 + y^2 + z = r^2$

rotate and/or translate to get new x, y, z

$$Ax^2 + By^2 + Cz^2 + J = 0$$

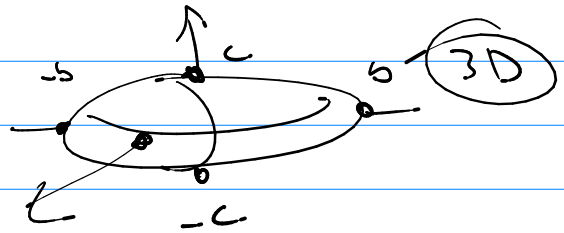
or

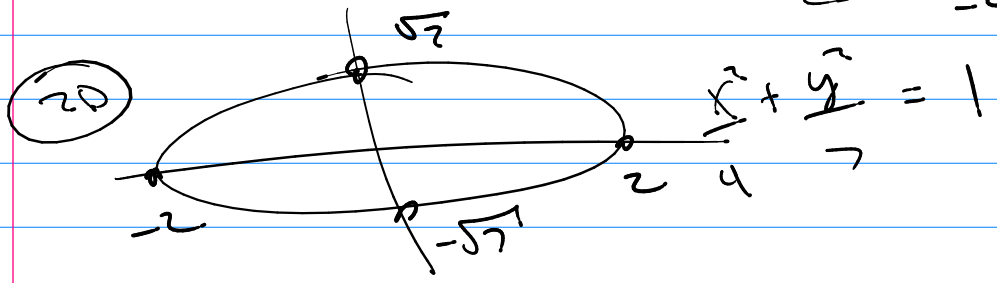
$$Ax^2 + By^2 + Iz = 0$$

6 Quadrics

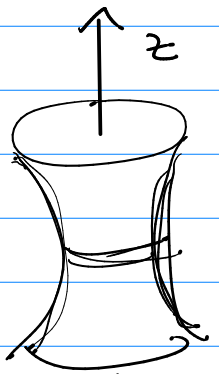
first 4 are $Ax^2 + By^2 + Cz^2 = D$

Ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$

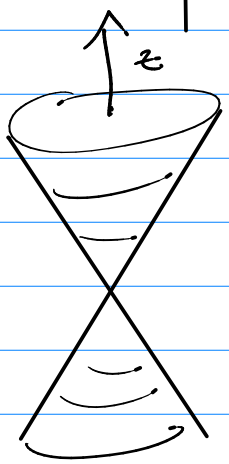




Hyperboloid of one sheet (about z-axis) $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$

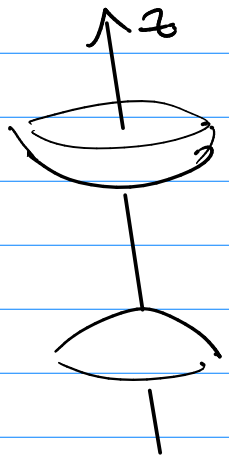


Cone (about z-axis) $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 0$



$\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = -1$

Hyperboloid of two sheets (about z-axis)

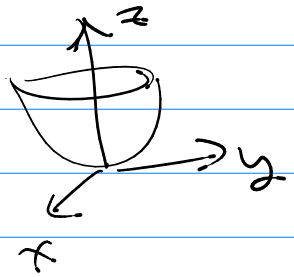


$$Ax^2 + By^2 + Iz = 0$$

$$\frac{z}{c} = \frac{x^2}{a^2} + \frac{y^2}{b^2}$$

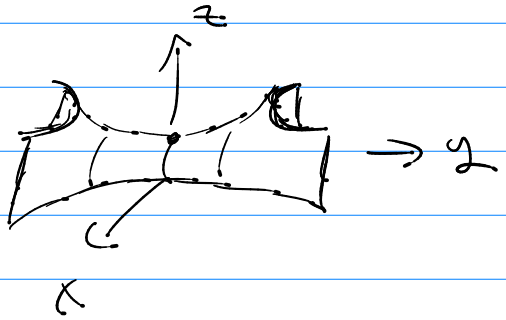
Elliptic Paraboloid

(about z-axis)



$$\frac{z}{c} = \frac{x^2}{a^2} - \frac{y^2}{b^2}$$

Hyperbolic Paraboloid

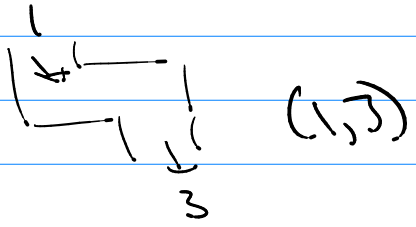


13.1 Functions

Domain, codomain

Notation: $f : A \to B$

Calc 1, 2: $f : \mathbb{R} \to \mathbb{R}$ ex



13.1: $f : \mathbb{R} \to$ Vector ex