Exam 1 Approaching! In FLINT 0050
next Wednesday, Sept 18^{th}, @ 8:30PM until 10PM.

CLAS Resources will likely hold a review on Monday evening via zoom. When that's officially announced, I'll send a canvas announcement :)

X5 #3 : Find parametric equations and symmetric equations for the line (use parameter t)
The line through point $(-3, 1, -2)$ and perpendicular to both $\underbrace{\langle 1, 1, 0\rangle}_{u}$ and $\underbrace{\langle -2, 1, 1\rangle}_{v}$.

step 1: To find a vector perpendicular to both u & v, we take the cross product:

diagonal
$$\left\{\begin{array}{ccccc} i & j & k & i & j \\ 1 & 1 & 0 & 1 & 1 \\ -2 & 1 & 1 & -2 & 1 \end{array}\right. \quad = i + k - j + 2k = \langle 1, -1, 3\rangle$$

step 2: Now I use starting point + t^* directional vector
$$(-3, 1, -2) + t\langle 1, -1, 3\rangle$$

$x = -3 + t$ $+3$ $+3$

$+t \quad -y \quad y = 1 - t \quad +t \quad -y$

$z = -2 + 3t$ $+2$ $+2$

symmetric = solve for t

$$\frac{z+2}{3} = \frac{3t}{3}$$

$$\left.\begin{array}{l} t = 3 + x \\ t = 1 - y \\ t = \dfrac{z+2}{3} \end{array}\right\} \text{symmetric equations}$$

Abby

Quadric :)

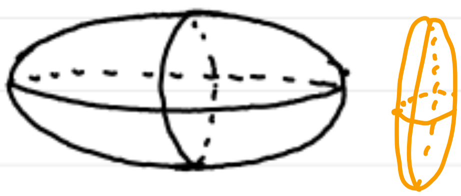
- Basic ~~Quadratic~~ Surfaces in standard form

★ Ellipsoid

special case is the sphere!

$a=b=c=1$

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



- all squared
- all positive 0 minus signs
- equal to 1

★ Hyperboloid of one sheet

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

- all squared
- one negative = one minus
- equal to 1

★ Hyperboloid of 2 sheets

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

- all squared
- two negative = 2 sheets
- equal to 1

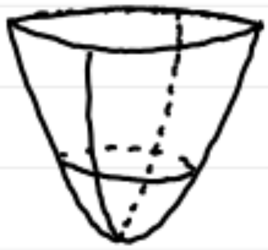
Elliptic Cone special

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 0$$

- all squared ✓
- one negative –
- equal to zero ✓

Elliptic Paraboloid

0 minus



one term is not squared

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

linear terms are degree 1 ⇒ paraboloid family

- two squared
- both positive
- equal to the unsquared variable

Hyperbolic paraboloid (pringle) (saddle)

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

- two squared
- one positive, one negative
- equal to the unsquared variable

Rapid Fire Xronos Practice

* put in standard form
* state shape

X6 #4

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

$$x = y^2 + \frac{z^2}{\left(\frac{1}{4}\right)} - 1$$

- one linear term
- no minus signs

elliptic paraboloid

* note $x = y^2 + 4z^2 + 1$ is still an elliptic paraboloid!

X6 #5

$$x^2 = 4y^2 + 2z^2$$
$$-x^2 \qquad -x^2$$

- all squared

$$0 = -x^2 + 4y^2 + 2z^2$$

$$0 = -x^2 + \frac{y^2}{\left(\frac{1}{4}\right)} + \frac{z^2}{\left(\frac{1}{2}\right)}$$

$$\left(\frac{1}{4}\right) = \left(\frac{1}{2}\right)^2$$

$$\frac{y^2}{3} = \frac{y^2}{(\sqrt{3})^2}$$

elliptic cone

X6 #8

$$4 + x^2 + y^2 - 4z^2 = 0$$
$$-4 \qquad\qquad -4$$

- all squared
- two minus signs

$$\frac{x^2 + y^2 - 4z^2}{-4} = \frac{-4}{-4}$$

$$\frac{-x^2}{4} - \frac{y^2}{4} + z^2 = 1$$

hyperboloid of 2 sheets

X6 #10*

$$x^2 + 4y^2 + 4z^2 + 4x - 16z + 16 = 0$$

$$\underbrace{x^2 + 4x + 4} + 4y^2 \quad \cancel{+4z^2 - 16z} = -\cancel{16} + 4 + \cancel{16}$$

$$4(z^2 - 4z + 4)$$

$$\frac{(x+2)^2 + 4y^2 + 4(z-2)^2}{4} = \frac{4}{4}$$

$$\frac{(x+2)^2}{4} + y^2 + (z-2)^2 = 1$$

- all quadratic
- all positive
- = 1

$\boxed{\text{ellipsoid}}$

X5 #10 Find an equation of the plane that passes through $(2,-2,0)$ and contains the line w/ symmetric equations $x = y = 2z$.