MA141-004

Tuesday, January 15

this week:

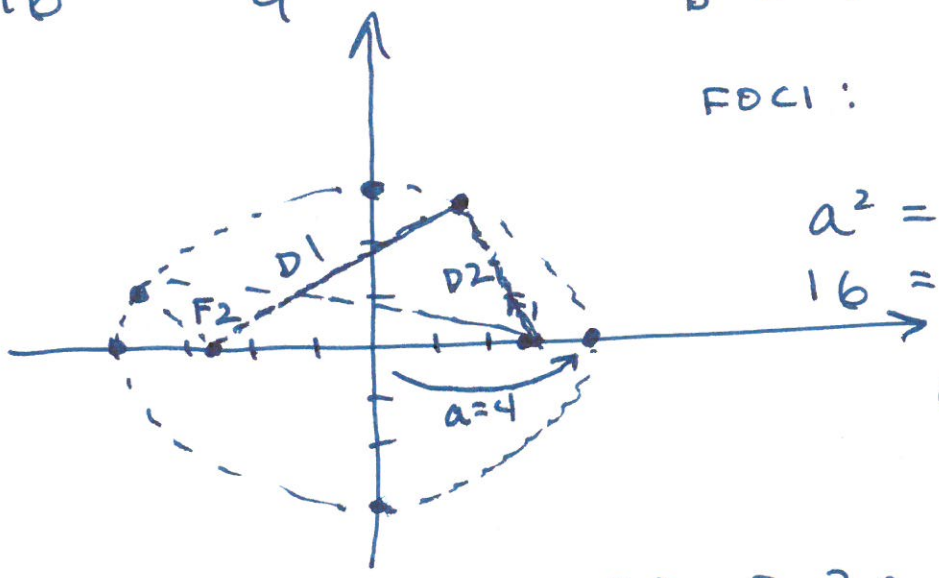
- finish ch 0 (review)
- begin ch 1 (limits)

ELLIPSE:

$$\frac{x^2}{16} + \frac{y^2}{9} = 1$$

$a^2 = 16 \quad a = 4$

$b^2 = 9 \quad b = 3$



FOCI:

$a^2 = b^2 + c^2$

$16 = 9 + c^2$

$c^2 = 7$

$c = \sqrt{7}$

$D1 + D2 = 2a$

$D1 + D2 = 8$

$F1: (\sqrt{7}, 0)$

$F2: (-\sqrt{7}, 0)$

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center @ (h, k)

$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$

$$4x^2+25y^2+24x+250y+561=0$$

$$4x^2+24x+25y^2+250y=-561$$

$$4(x^2+6x+9)+25(y^2+10y+25)=-561$$

$$+36$$

$$+625$$

$$\frac{4(x+3)^2}{100}+\frac{25(y+5)^2}{100}=\frac{100}{100}$$

$$\frac{(x+3)^2}{25}+\frac{(y+5)^2}{4}=1$$

$a^2=25$, $a=5$

$b^2=4$, $b=2$

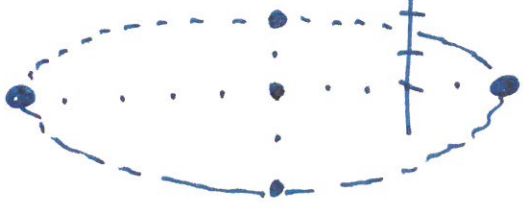
center $(-3,-5)$

$$a^2=b^2+c^2$$

$$25=4+c^2$$

$$c^2=21$$

$$c=\sqrt{21}$$



F1: $(-3+\sqrt{21},-5)$

F2: $(-3-\sqrt{21},-5)$

circle:

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

$(a^2 = b^2)$

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

$$x^2 + y^2 = a^2$$

$$\uparrow$$

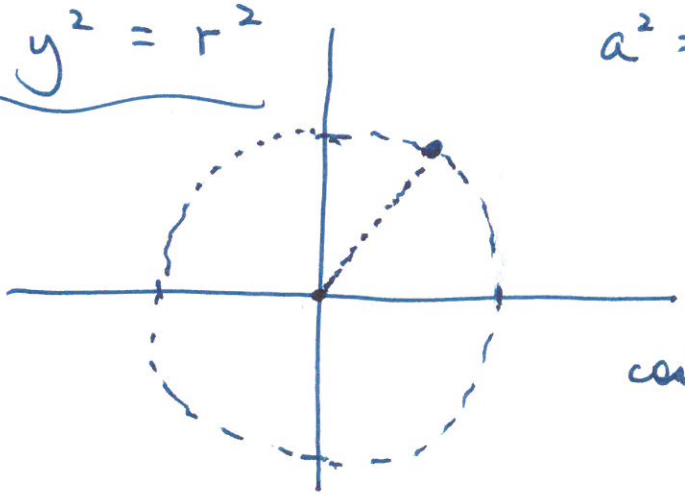
$$x^2 + y^2 = r^2$$

$a^2 = b^2$

$a^2 = b^2 + c^2$

$c^2 = 0$

$c = 0$



center = foci

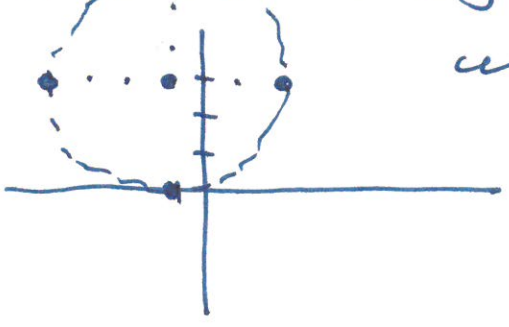
$$x^2 + y^2 + 2x - 6y + 1 = 0$$

$$x^2+2x+1 \quad + y^2 - 6y + 9 = -1 + 1 + 9$$

$$(x+1)^2 + (y-3)^2 = 9$$

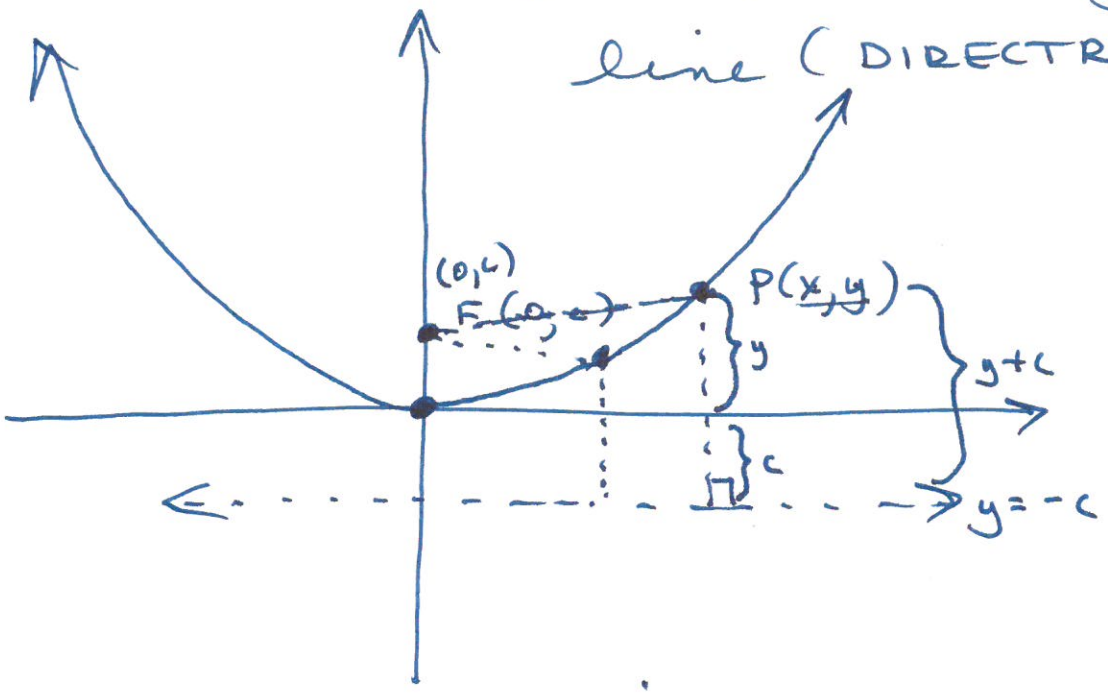
center $(-1, 3)$

$r = 3$



Parabola: set of pts in a plane equidistant from a given point (FOCUS) and a given line (DIRECTRIX)

$y = x^2$



equation:

$$\left(\sqrt{(x-0)^2+(y-c)^2}\right)^2 = (y+c)^2$$

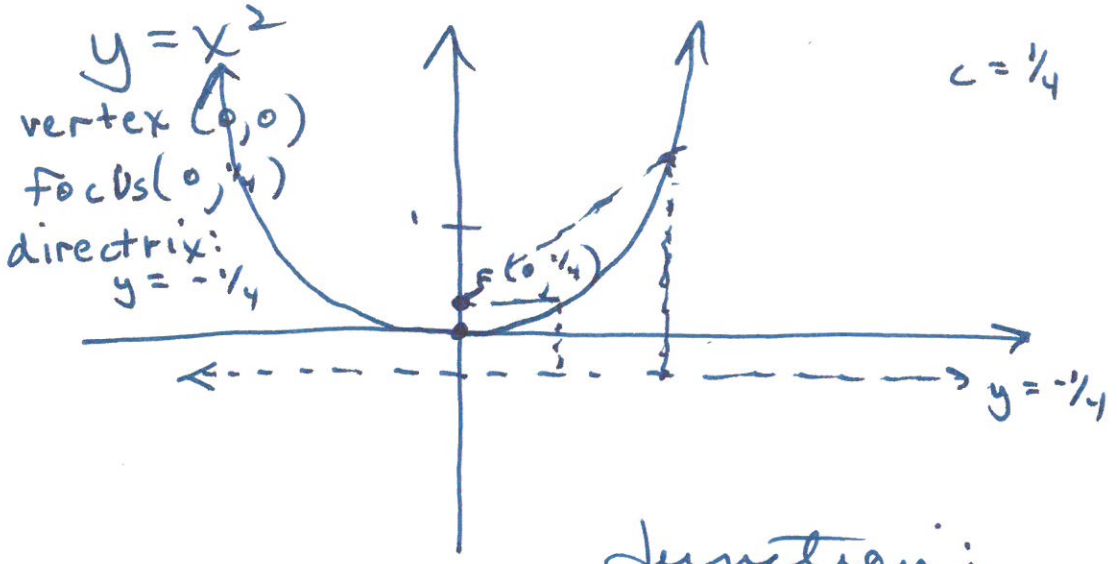
$$(x-0)^2+(y-c)^2 = (y+c)^2$$

$$x^2 + y^2 - 2cy + c^2 = y^2 + 2cy + c^2$$

$$x^2 = 4cy$$

$$\boxed{y = \frac{1}{4c}\cdot x^2}$$

$$\begin{cases} y = 1\cdot x^2 \\ y = \frac{1}{4c}\cdot x^2 \end{cases} \qquad 1 = \frac{1}{4c} \qquad 4c = 1 \qquad c = 1/4$$



functions:

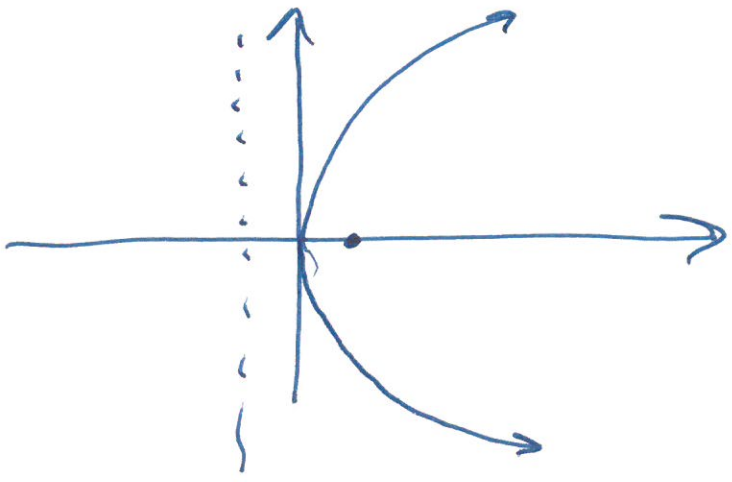
(1.5, 11 ft) & (1.5, 9 ft)

(7, 10.21) & (7, 11.49)

(173489, 1.79) & (173489, 34.80)

$y = \frac{1}{4c} x^2$ functions

$x = \frac{1}{4c} y^2$ non-functions



$$y^2 - 4x + 2y + 9 = 0$$

$$y^2 + 2y + 1 = 4x - 9 + 1$$

$$(y+1)^2 = 4x - 8$$

$$(y+1)^2 = 4(x-2)$$

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

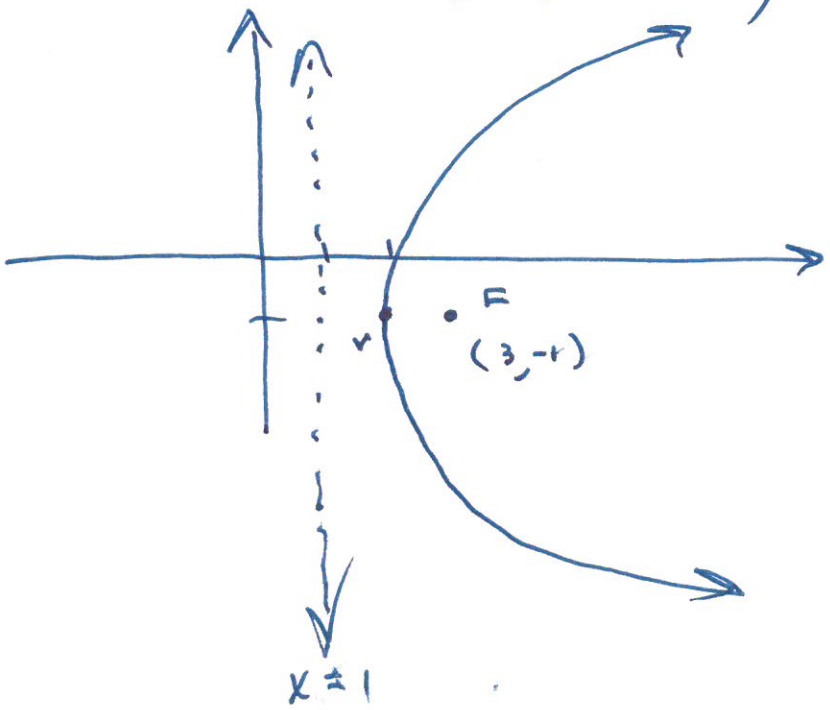
$$(x-2) = \frac{1}{4}(y+1)^2$$

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

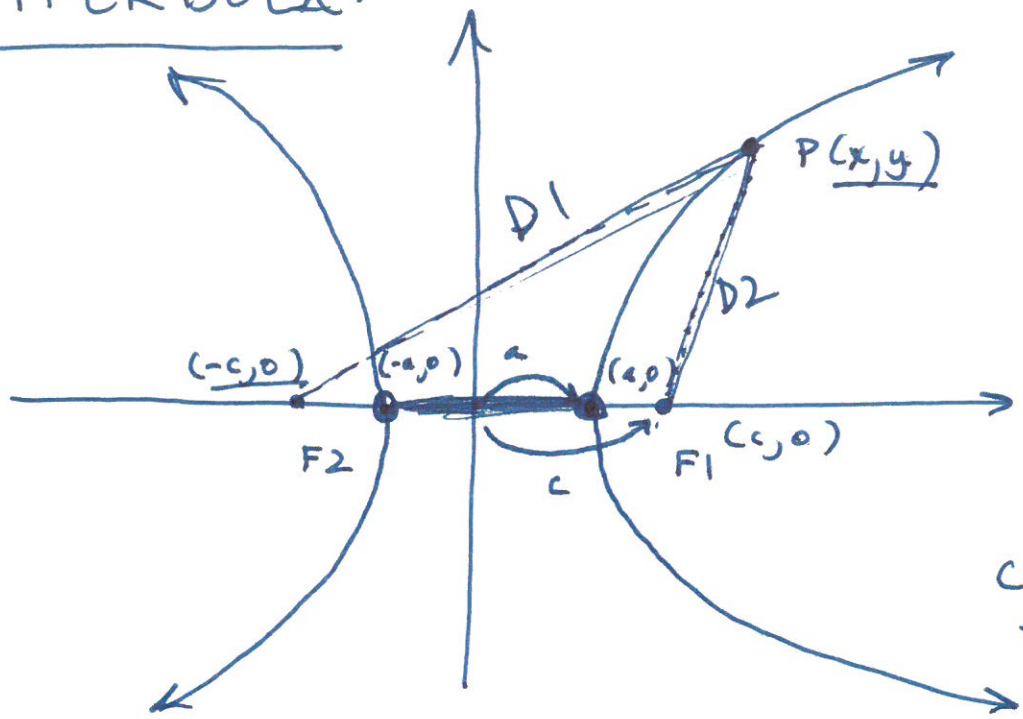
$\frac{1}{4} = \frac{1}{4c}$

vertex: $(2, -1)$

opens RT.



HYPERBOLA:



$$c^2 = a^2 + b^2$$

$$|D1 - D2| = 2a$$

$$\sqrt{(x+c)^2 + (y-0)^2} - \sqrt{(x-c)^2 + (y-0)^2} = 2a$$

$$\left(\sqrt{(x+c)^2 + y^2}\right)^2 = \left(2a + \sqrt{(x-c)^2 + y^2}\right)^2$$

$$(x+c)^2 + y^2 = 4a^2 + 4a\sqrt{(x-c)^2 + y^2} + (x-c)^2 + y^2$$

isolate radical ... square again

$$\vdots$$

HYPERBOLA (transverse axis on the x-axis)

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

$$\frac{x^2}{36} - \frac{y^2}{16} = 1$$

$a^2 = 36$

$b^2 = 16$

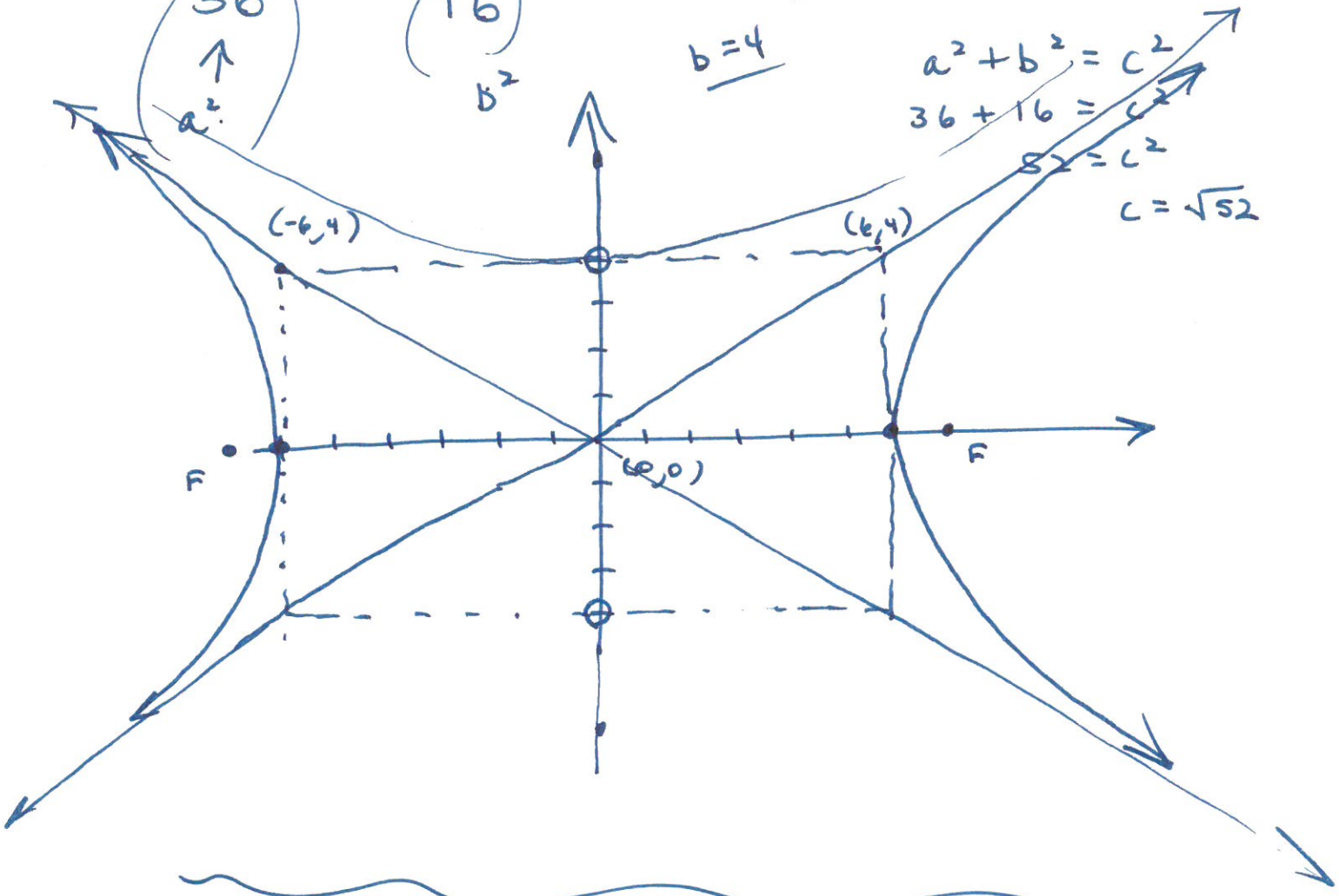
$b = 4$

$a^2 + b^2 = c^2$

$36 + 16 = c^2$

$52 = c^2$

$c = \sqrt{52}$



$$\frac{y^2}{16} - \frac{x^2}{36} = 1$$

a^2

(9)

$$16x^2 - 9y^2 - 96x - 36y - 36 = 0$$

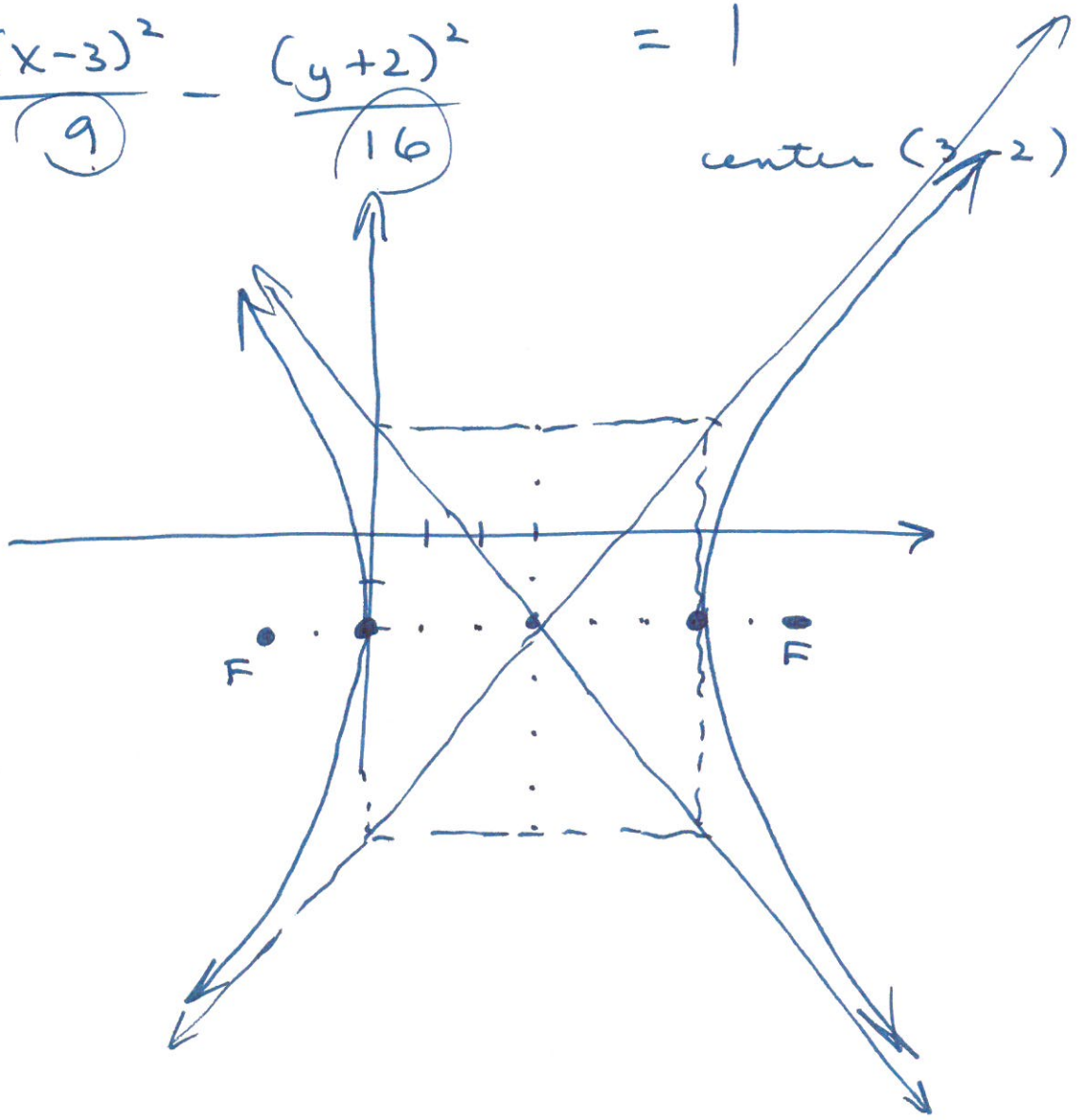
$$16x^2 - 96x \quad - 9y^2 - 36y \quad = 36$$

$$16(x^2 - 6x + 9) - 9(y^2 + 4y + 4) = 36 + 144 - 36$$

$$\frac{16(x-3)^2}{144} - \frac{9(y+2)^2}{144} = \frac{144}{144}$$

$$\frac{(x-3)^2}{9} - \frac{(y+2)^2}{16} = 1$$

center $(3, -2)$



$(x, y) \longrightarrow (f(t), g(t))$

parametric

parameter is "t"

$(t \geq 0)$

ex:

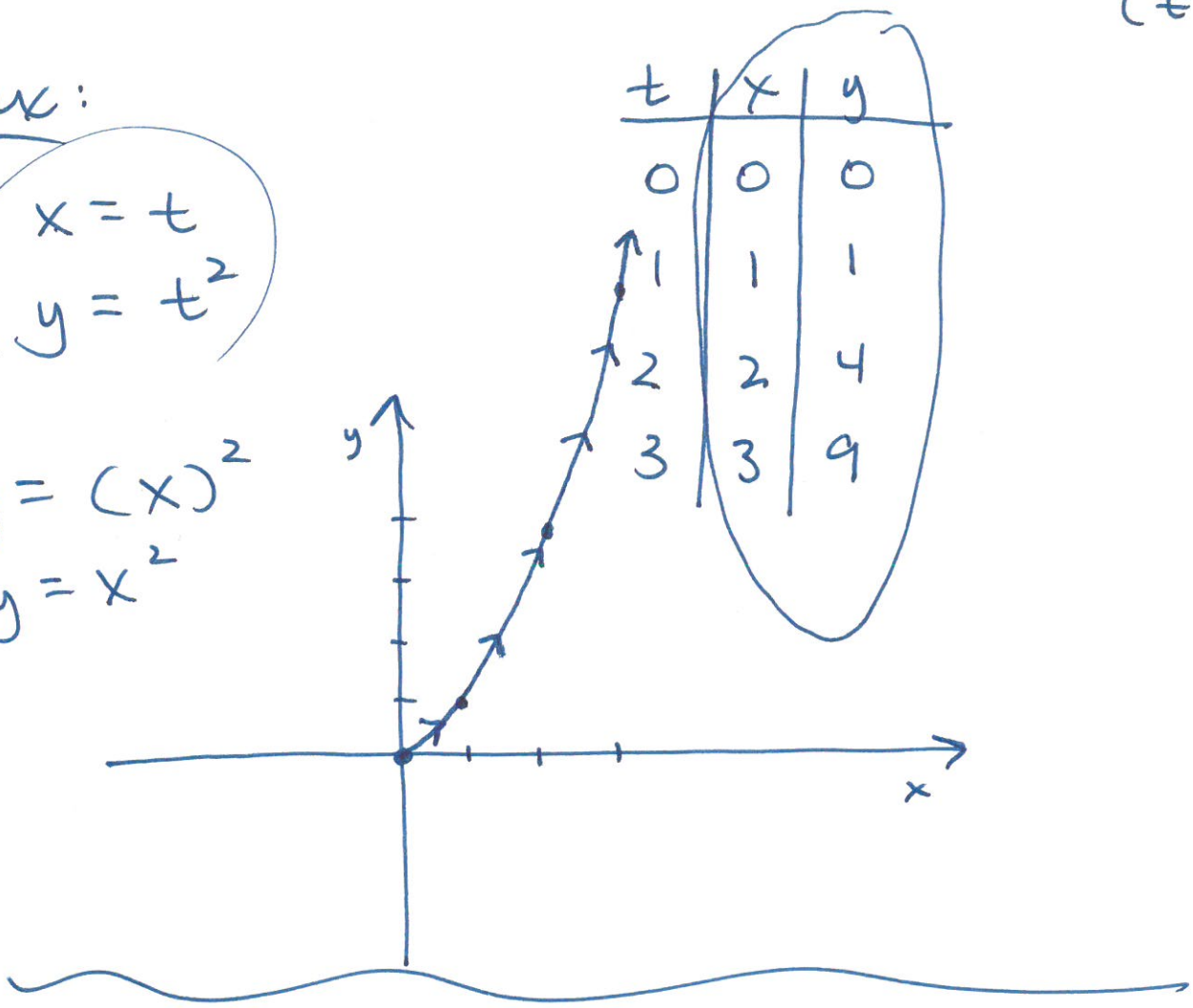
$x = t$

$y = t^2$

t	x	y
0	0	0
1	1	1
2	2	4
3	3	9

$y = (x)^2$

$y = x^2$



$x = 4\cos t$ $\qquad$ $y = 3\sin t$

$\frac{x}{4} = \cos t$ $\qquad$ $\frac{y}{3} = \sin t$

$\sin^2 t + \cos^2 t = 1$

$\left(\frac{y}{3}\right)^2 + \left(\frac{x}{4}\right)^2 = 1$

$\frac{y^2}{9} + \frac{x^2}{16} = 1$

The Alma Mater of NC State

Where the winds of Dixie softly blow o'er the fields of Caroline,
There stands ever cherished, N.C. State, as thy honored shrine
So lift your voices! Loudly sing from hill to oceanside!
Our hearts ever hold you, N.C. State in the folds of our love and pride

Words by Alvin Fountain : Class of '22

Music by Bonnie Norris: Class of '23