MA 141 - 005
Monday, January 14

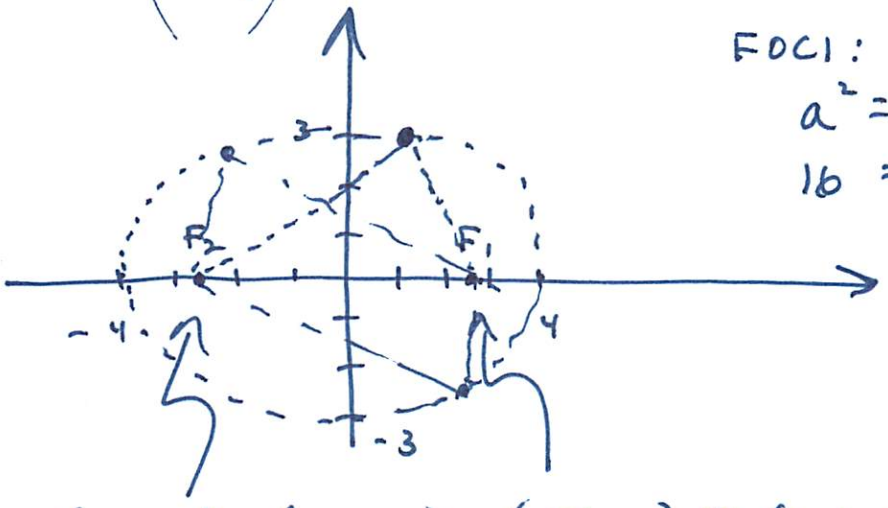
this week:

- finish ch 0
- begin ch 1 (LIMITS)

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

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

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



FOCI:

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

$16 = 9 + c^2$

$c^2 = 7$

$c = \sqrt{7}$

$(-\sqrt{7}, 0) \approx (-2.6, 0) \quad (\sqrt{7}, 0) \approx (2.6, 0)$

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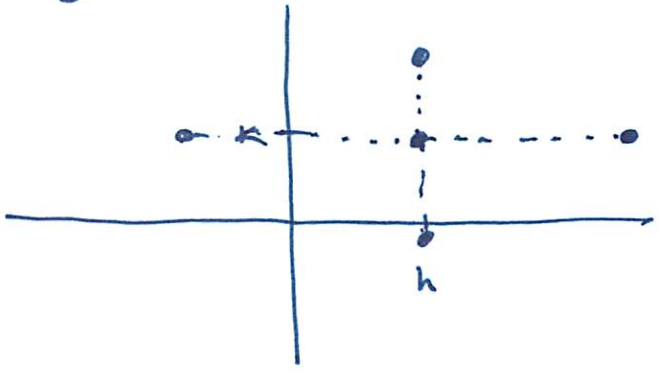
center other than the origin: (h, k)

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



$(x-h)^2 \;?\; (y-k)^2$

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

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

$$4(x^2 + 6x + 9) + 25(y^2 + 10y + 25) = -561 + 36 + 625$$

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

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

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

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

$25 = 4 + c^2$

$c^2 = 21$

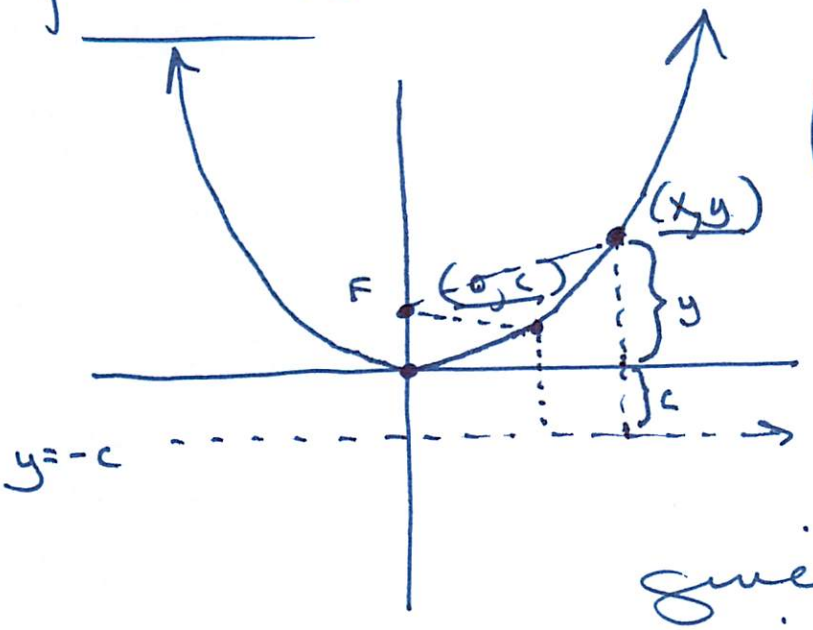
center $(-3, -5)$

$c = \sqrt{21}$

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

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

parabola:



(c = dist from vertex to focus.)

a function

given point: FOCUS

given line: DIRECTRIX

DEF: EQUIDISTANT FROM A GIVEN POINT & A GIVEN LINE.

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

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

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

$$x^2 = 4cy$$

(solve for y)

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

(1.5, 7 ft)
(1.5, 11 ft)

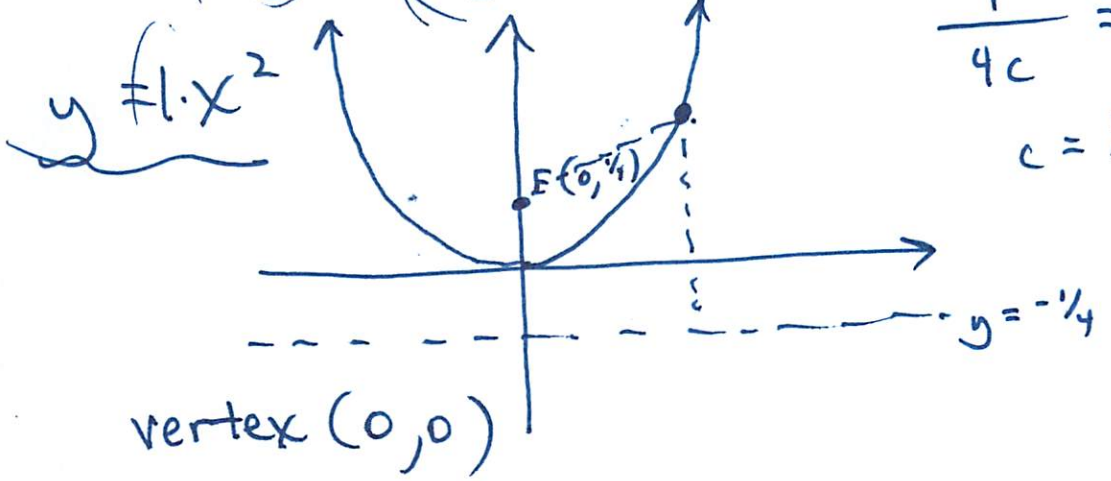
(15, 10,000.00)
(15, 2.50)
(7, 10.21)
(7, 9.97)

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

$y = 1 \cdot x^2$

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

$c = 1/4$



vertex (0,0)

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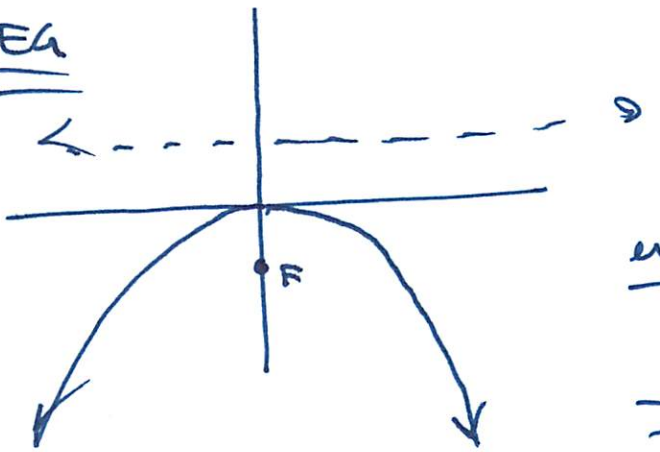
c is NEG



ex: $y = (-4)x^2$

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

$-16c = 1$

$c = -\frac{1}{16}$

vertex (h, k)

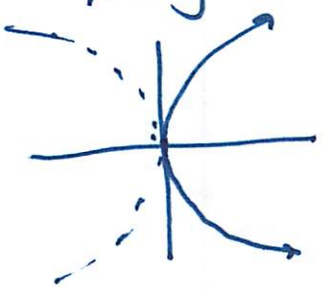
$y - k = \frac{1}{4c}(x - h)^2$

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

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

non function

$x = y^2$



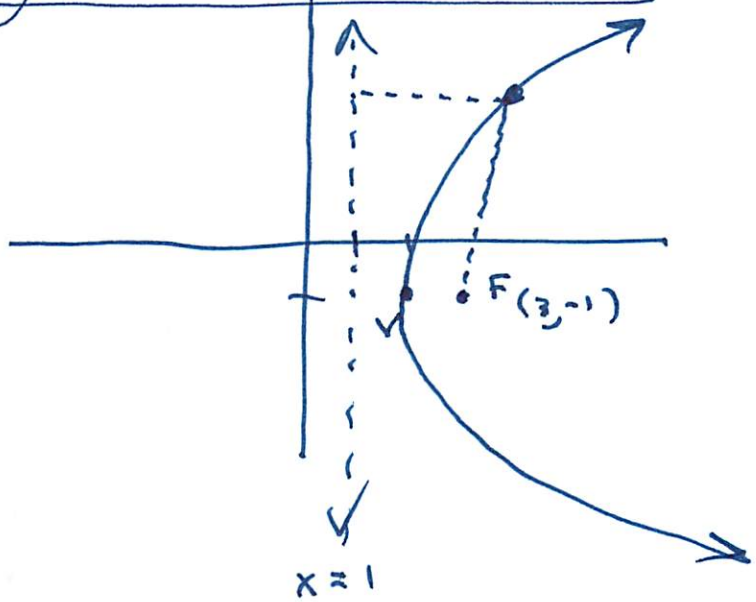
$$(y+1)^2 = 4x - 8$$

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

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

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

$c = 1$



circle:

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

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

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

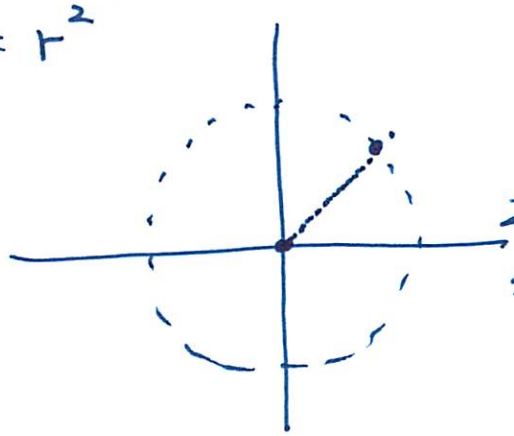
$$x^2 + y^2 = r^2$$

ELLIPSE:

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

$$c^2 = 0$$

$$c = 0$$



2 FOCI ARE AT THE CENTER

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

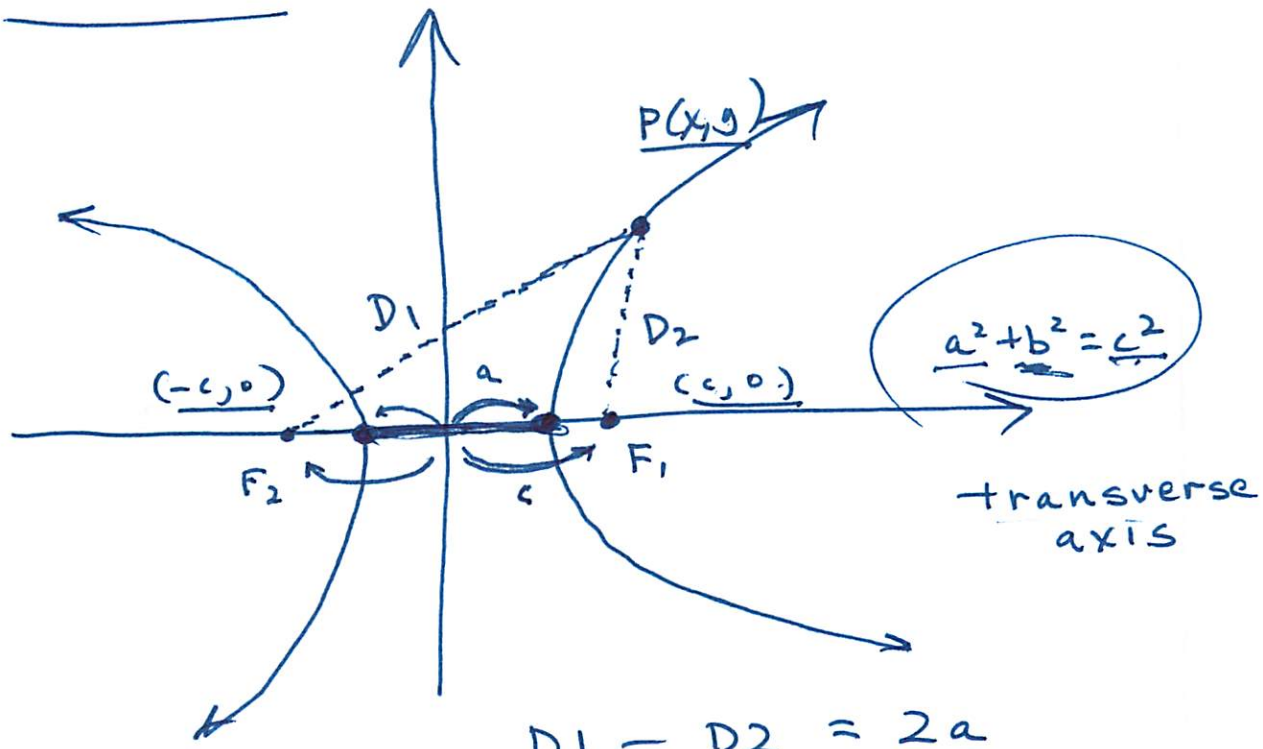
$$x^2 + 2x + 1 + y^2 - 6y + 9 = -1 + 1 + 9$$

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

center $(-1, 3)$

$r = 3$

HYPERBOLA :



$$D1 - D2 = 2a$$

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

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

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

isolate the radical .....
square again

⋮

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

HYPERBOLA
+transverse axis on the x-axis

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

$\uparrow$

a^2

$a^2 = 36$

$a = 6$

$b^2 = 16$

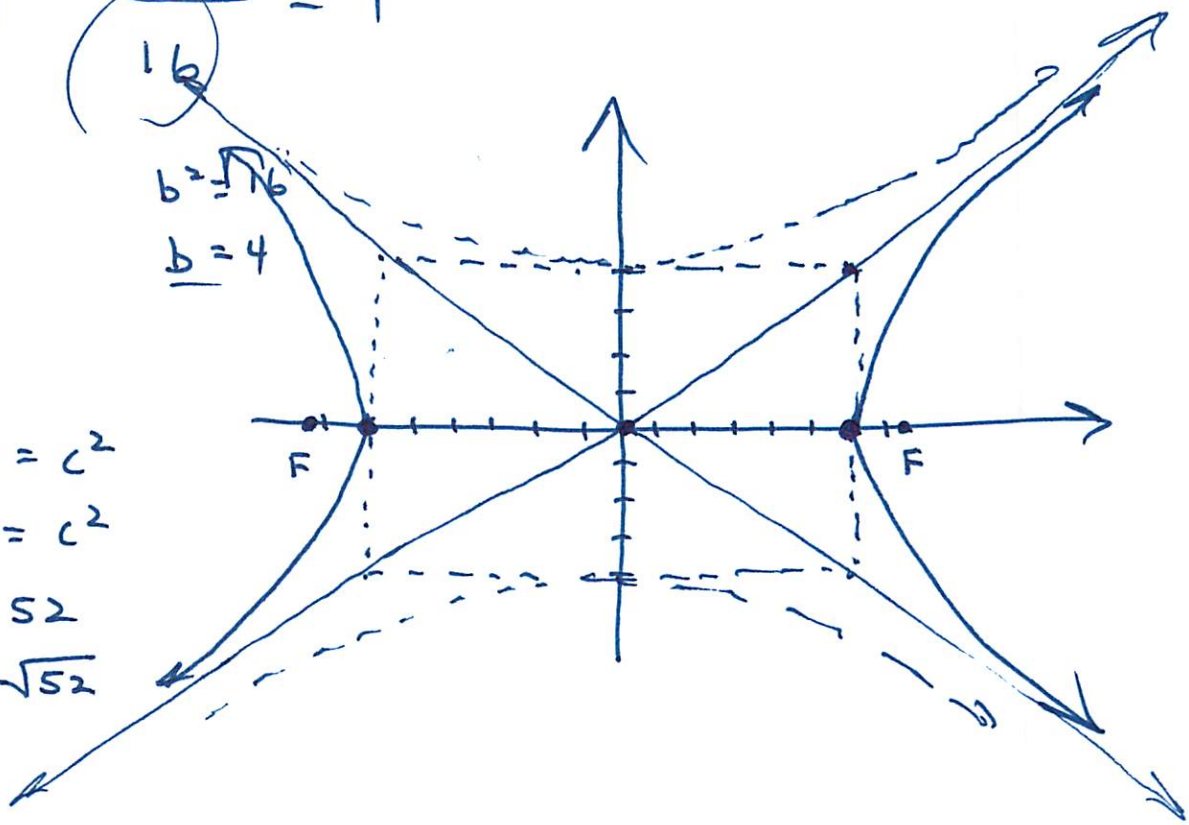
$b = 4$

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

$36 + 16 = c^2$

$c^2 = 52$

$c = \sqrt{52}$



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

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

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

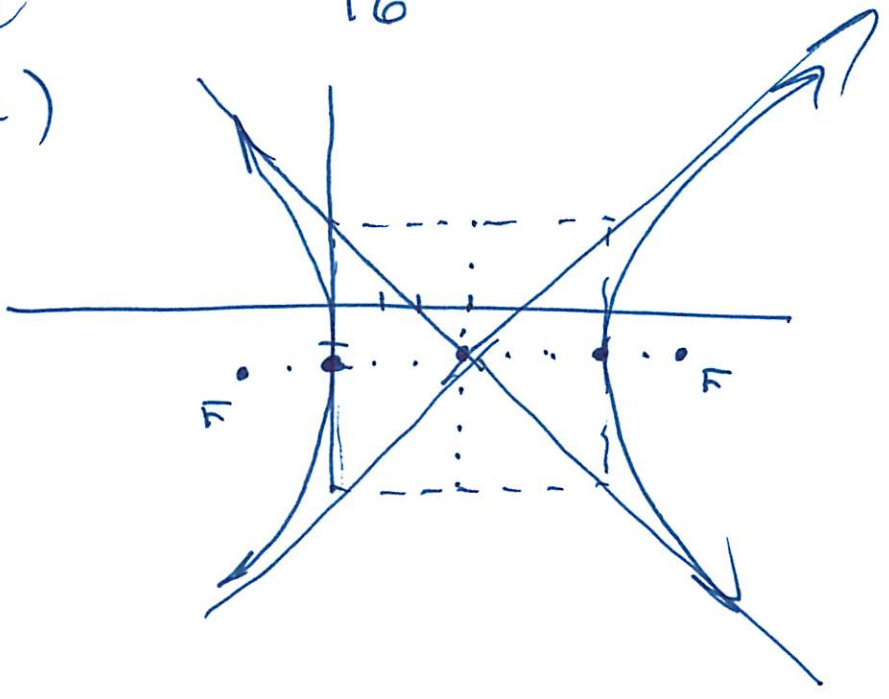
$$16x^2 - 96x \quad - 9y^2 - 36y \quad = 36$$

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

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

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

$(h, k) = (3, -2)$



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