

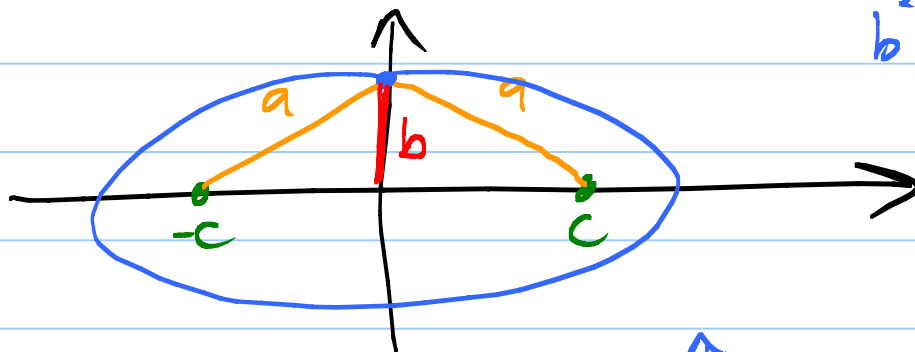
Read Appendix A.7 on complex numbers.

HWK 14 due Tues. Dec. 6. (11.4, 11.5, 11.6)

Ellipse:

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

Note:
 $a > b$

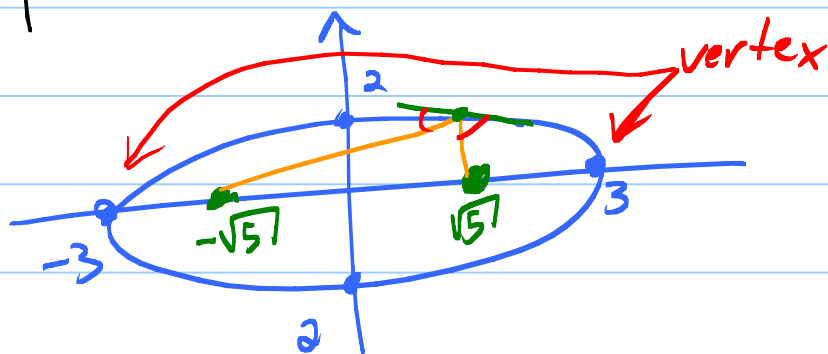


$$b^2 + c^2 = a^2$$

$$\frac{x^2}{9} + \frac{y^2}{4} = 1$$

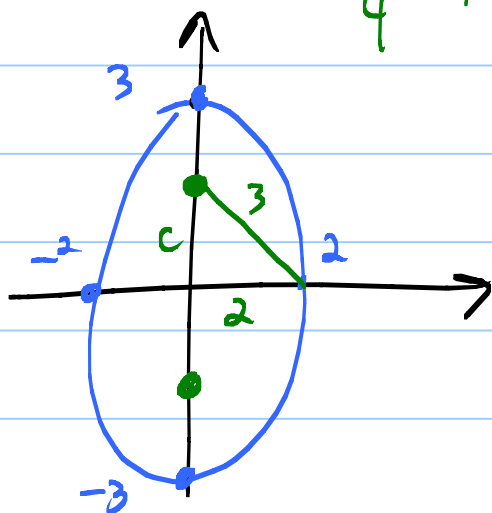
$a=3$ $b=2$

$$c = \sqrt{a^2 - b^2} = \sqrt{5}$$



a = semimajor axis
 b = semiminor axis

What about $\frac{x^2}{4} + \frac{y^2}{9} = 1$?



big one

Foci on y -axis.
 $c = \sqrt{5}$

Eccentricity $e = \frac{c}{a}$

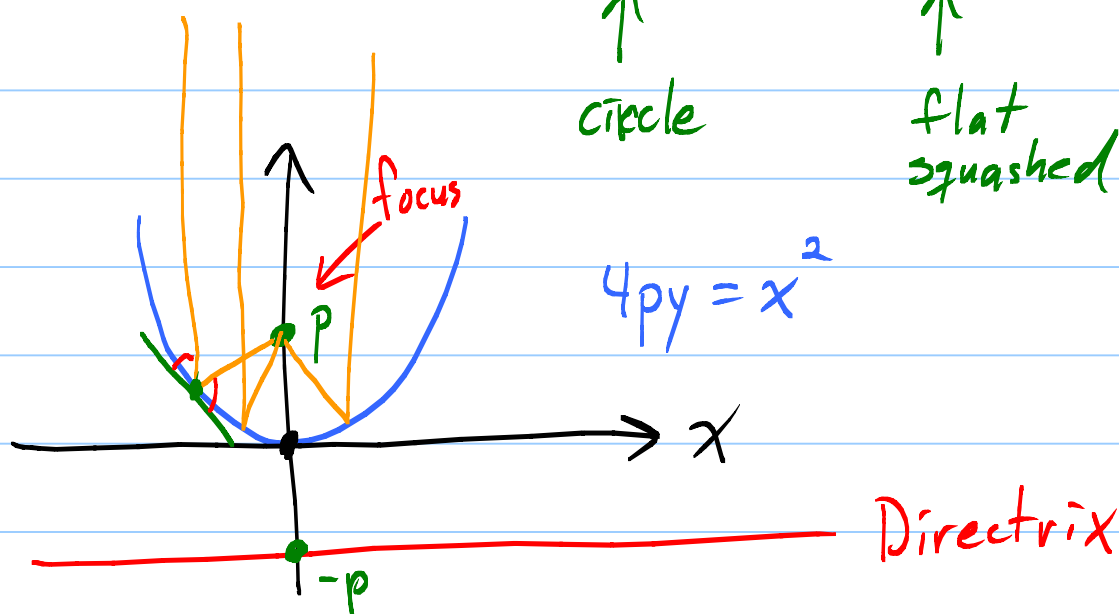
$$0 < e < 1$$

2

↑
circle

↑
flat
squashed

Parabolas:

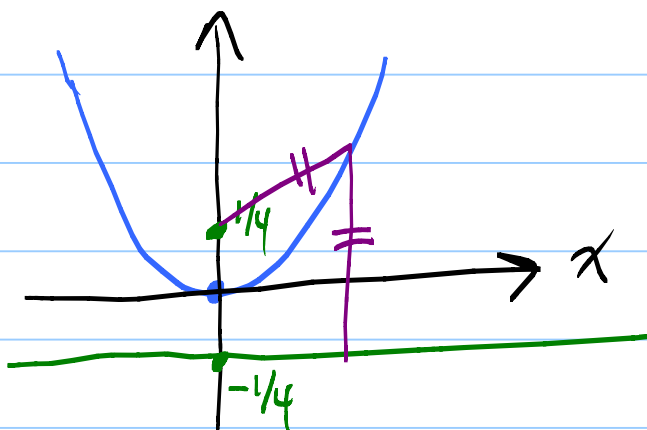


EX:

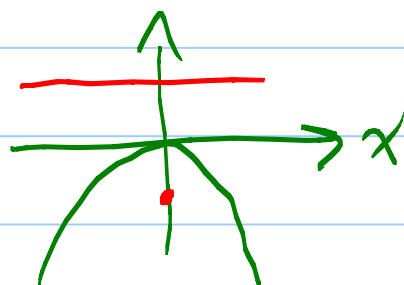
↑ $y = x^2$

$4p = 1$

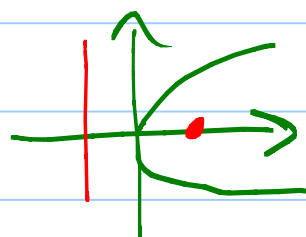
$p = 1/4$



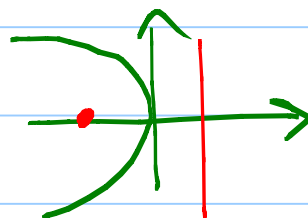
Other orientations:



$$-4py = x^2$$



$$4px = y^2$$



$$-4px = y^2$$

Basic skill: Completing the square.

EX: $x^2 + y^2 + \frac{1}{3}x - \frac{2}{3}y = 0$

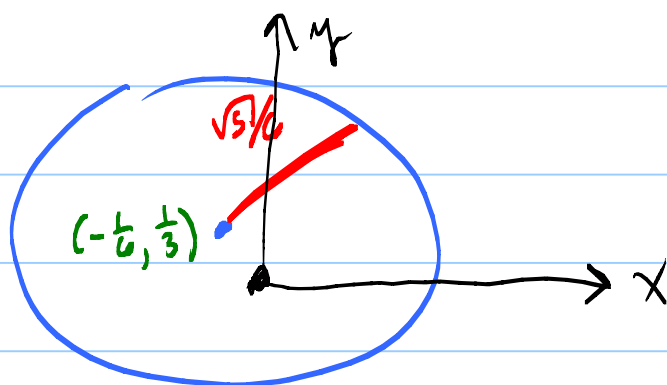
3

$$x^2 + \frac{1}{3}x + y^2 - \frac{2}{3}y = 0$$

$$\left(x + \frac{1}{6}\right)^2 - \frac{1}{36} \quad \left(y - \frac{1}{3}\right)^2 - \frac{1}{9} = 0$$

$$\left(x + \frac{1}{6}\right)^2 + \left(y - \frac{1}{3}\right)^2 = \frac{1}{36} + \frac{1}{9} = \frac{5}{36}$$

$$\sqrt{\left(x + \frac{1}{6}\right)^2 + \left(y - \frac{1}{3}\right)^2} = \frac{\sqrt{5}}{6}$$



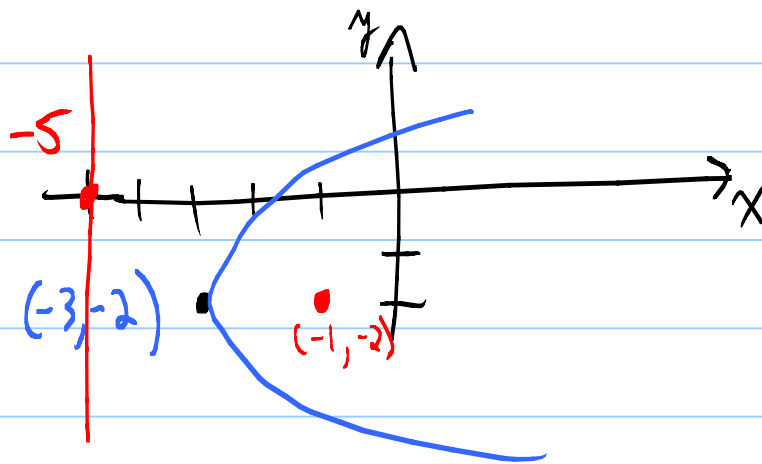
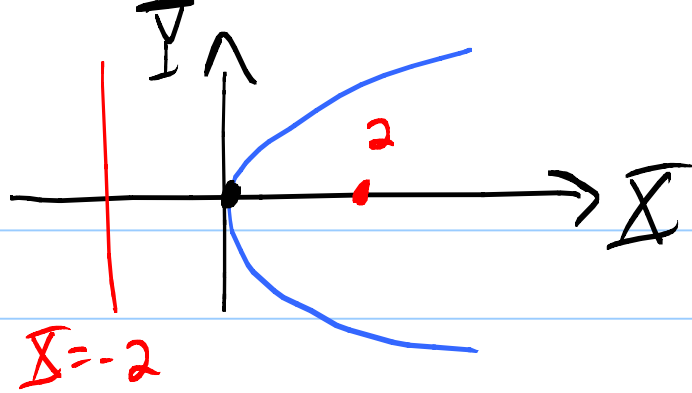
EX: $y^2 + 4y - 8x - 20 = 0$

$$(y + 2)^2 - 4 - 8x - 20 = 0$$

$$\underbrace{(y + 2)^2}_Y = 8x + 24 = 8 \underbrace{(x + 3)}_X$$

$$Y^2 = 8X = 4 \cdot (2) X$$

$\uparrow p=2$



Pick it up and
move the vertex
to $(-2, -3)$.

EX: $7y = x^2$

$4 \cdot \frac{7}{4} y = x^2$

$\uparrow p = \frac{7}{4}$

EX: $4x^2 + 9y^2 - 8x + 36y + 4 = 0$

$$4x^2 - 8x + 9y^2 + 36y = -4$$

$$4[x^2 - 2x] + 9[y^2 + 4y] = -4$$

$$4[(x-1)^2 - 1] + 9[(y+2)^2 - 4] = -4$$

$$4(x-1)^2 + 9(y+2)^2 = -4 + 4 + 36$$

36

$$\frac{(x-1)^2}{9} + \frac{(y+2)^2}{4} = 1$$

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

Ellipse centered at $(1, -2)$

