

Question:

Find the focus and the directrix of the parabola of equation  $x = 4y^2$

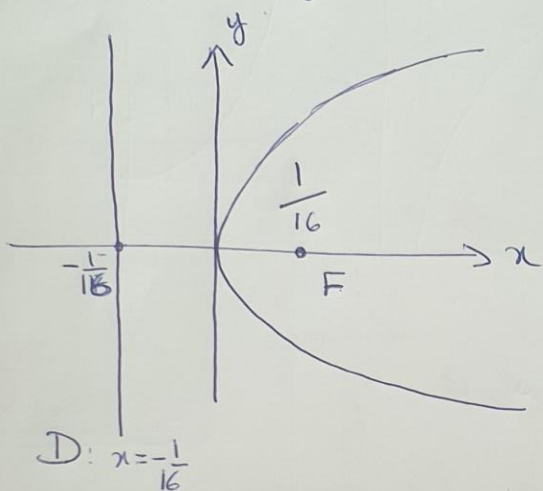
Answer:

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

$$a = \frac{\frac{1}{4}}{4} = \frac{1}{16}$$

$$F\left(\frac{1}{16}, 0\right)$$

$$D: x = -\frac{1}{16}$$



What about  $2y^2 = -x$

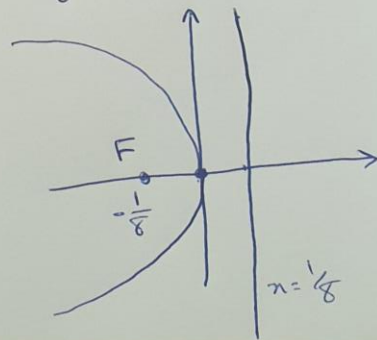
Answer: We have  $2y^2 = -x \Leftrightarrow y^2 = -\frac{1}{2}x$ .

and  $4a = -\frac{1}{2} \Leftrightarrow a = -\frac{1}{8}$ .

Therefore, the focus is

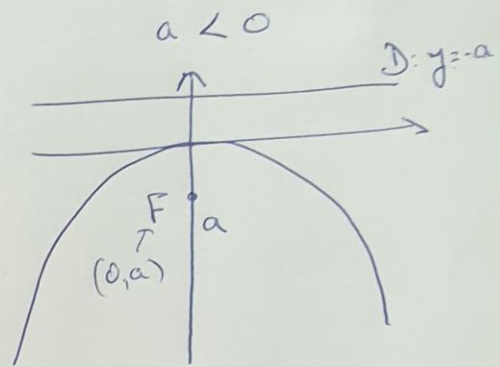
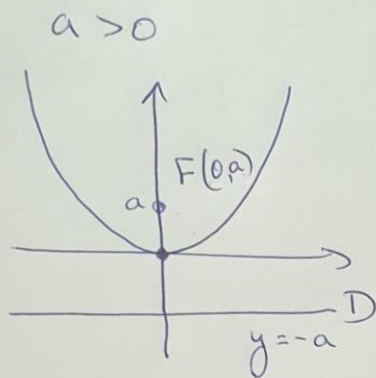
$F\left(-\frac{1}{8}, 0\right)$   
and the directrix

$$D: x = \frac{1}{8}$$



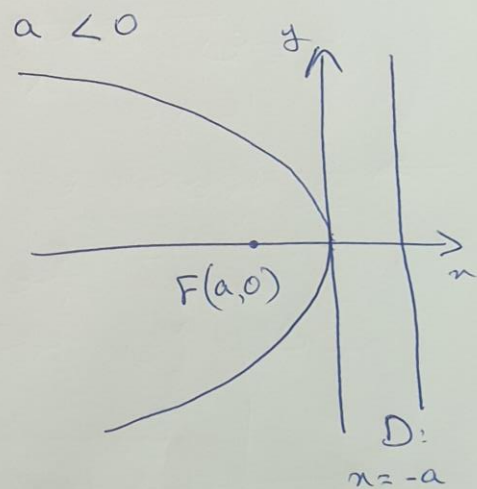
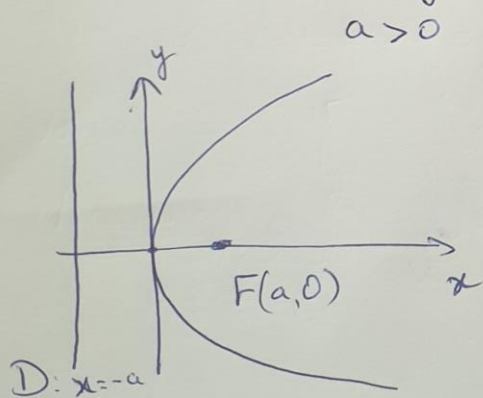
For the equation

$$x^2 = 4ay$$

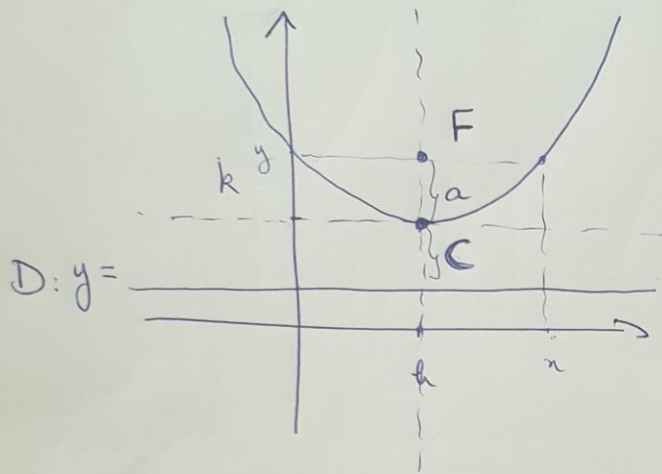


For the equation

$$y^2 = 4ax$$



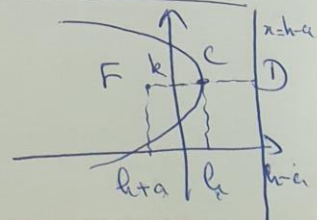
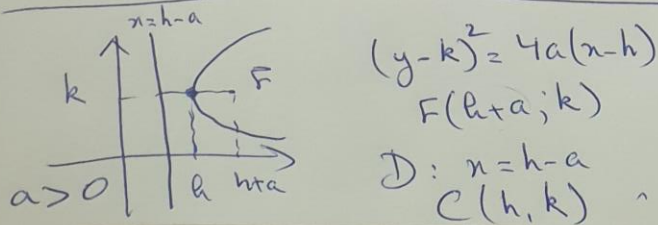
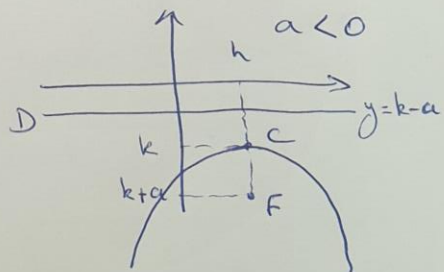
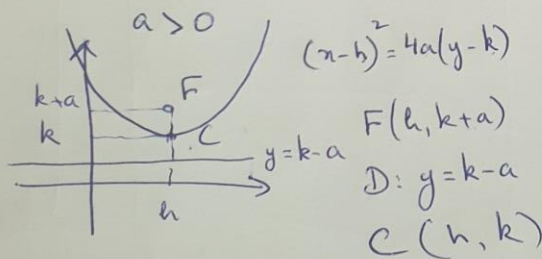
If the center of the parabola is  $C(h; k)$ . (The vertex  $V$ )



The focus:  
 $F(h; k+a)$   
 The directrix:  
 $D: y = k-a$

The equations:

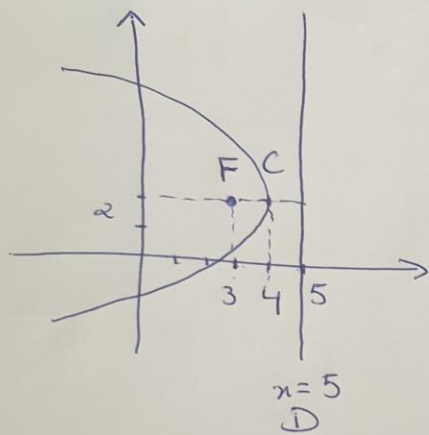
$$(x-h)^2 = 4a(y-k)$$



Example:

Give the equation of the parabola  
of focus  $F(3; 2)$  and directrix  
 $D: x = 5$

Answer:



The center:

$$C(4; 2)$$

$$\frac{3+5}{2}$$

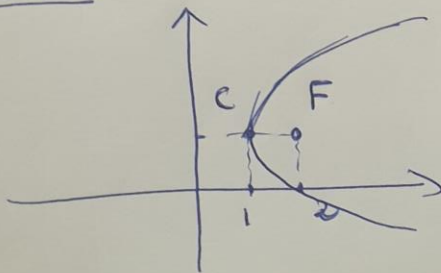
$$\boxed{-4(x-4) = (y-2)^2}$$

where  $a = 3 - 4 = -1$

Give the equation of the parabola  
of focus  $F(2, 1)$  and center  $C(1, 1)$

Answer:

we have  $a = 2 - 1 = 1$



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

Question: Find the elements of the parabola of equation  $(y-3) = 6(x+2)^2$

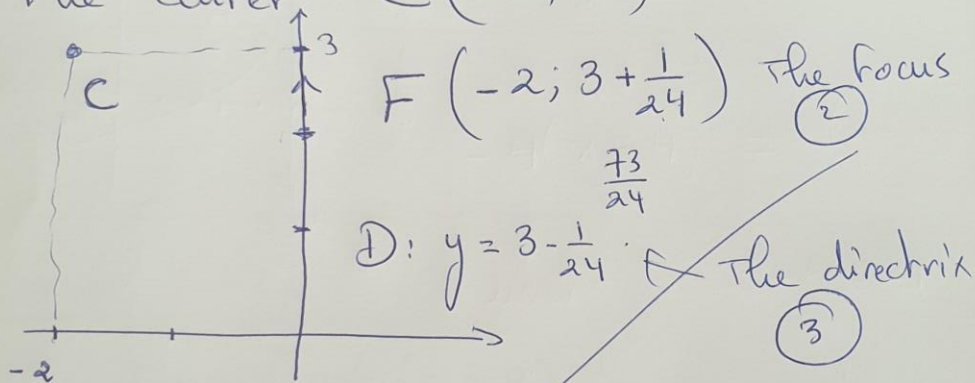
Answer: The equation is equivalent

$$\text{to } (x+2)^2 = \frac{1}{6}(y-3)$$

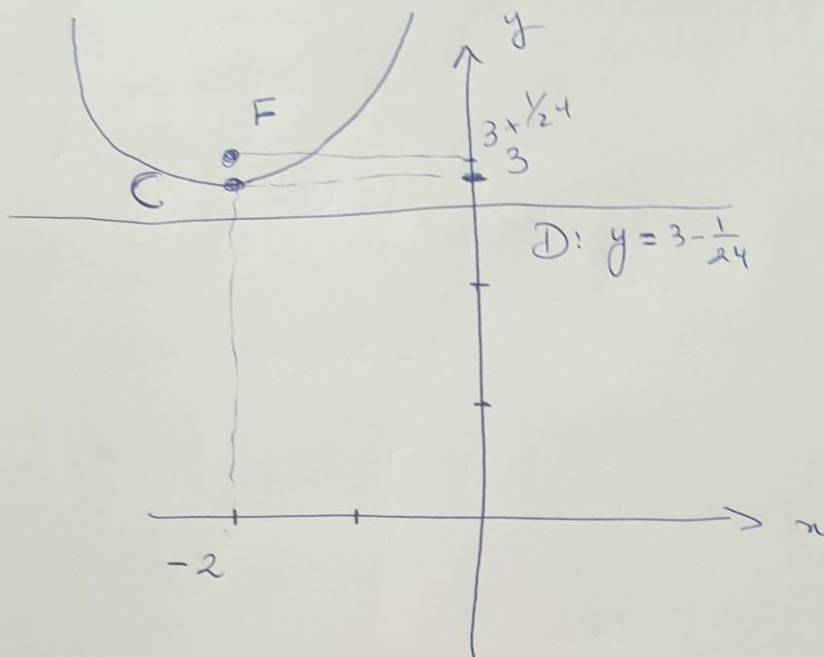
$$\text{So } h = -2; k = 3; a = \frac{1}{6} = \frac{1}{24}$$

The elements:

① The center  $C(-2; 3)$







Notice that:

$$(y-3) = 6(x+2)^2$$

$$\Leftrightarrow (y-3) = 6(x^2 + 4x + 4)$$

$$= 6x^2 + 24x + 24$$

$$\Leftrightarrow \boxed{6x^2 + 24x - y + 27 = 0}$$

The next lecture we will see how to complete the square.