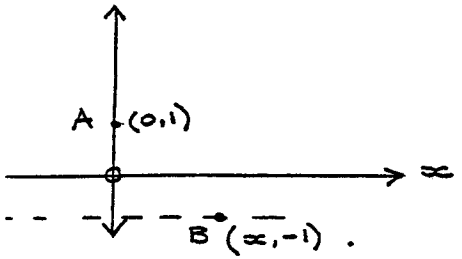


2 Unit Mathematics

LOCUS and the PARABOLA.

1. Find the equation of the point that moves so it is equidistant from the point $(0, 1)$ and the line $y = -1$.
2. Find the equation of the parabola that has focus $(1, 4)$ and directrix $x = 3$.
3. For the parabola $x^2 = 20y$, find:
 - a) the coordinates of the focus
 - b) the equation of its axis of symmetry
 - c) the equation of the directrix
 - d) its focal length
4. Find the coordinates of the focus and the equation of the directrix of the parabola $y^2 = 10x$. Sketch the parabola, showing these two features.
5. Find the equation of the locus of the point moving so that it is equidistant from the point $(3, 5)$ and the line $y = -1$.
6. Find the coordinates of the vertex and the focus, and the equation of the directrix of the parabola with equation
$$x^2 - 10x - 16y - 7 = 0.$$
7. Find the equation of the parabola with focus $(-2, 1)$ and vertex $(-2, -4)$.
8. Find the coordinates of the vertex and focus and the equation of the directrix for the parabola
$$y^2 + 6y - 4x - 11 = 0$$
Sketch the parabola, showing these features.

Solutions to Parabola and Locus Sheet.



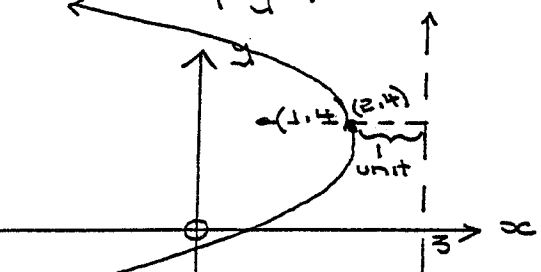
Let $P(x, y)$ be a point equidistant from $A(0, 1)$ and $B(x, -1)$.

$AP = PB$

$$\sqrt{(x-0)^2 + (y-1)^2} = \sqrt{(x-x)^2 + (y+1)^2}$$

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

$$x^2 = 4y$$



Negative because facing left.

$a = -1$. Vertex $(2, 4)$

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

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

a) $4a = 20$

$a = 5$

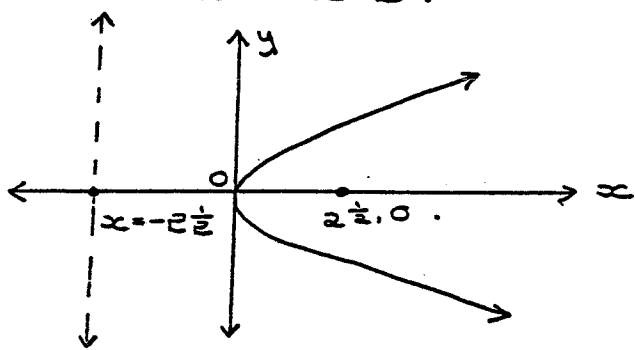
$(0, 5)$

$x = 0$

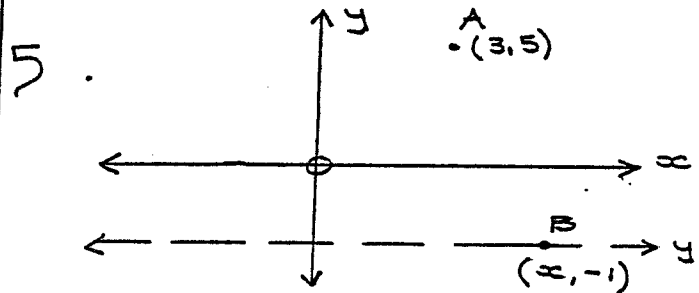
$y = -5$

focal length = 5

4. $4a = 10$
 $a = \frac{10}{4}$
 $a = 2\frac{1}{2}$



Directrix $x = -2\frac{1}{2}$



Let $P(x, y)$ be a point equidistant from $A(3, 5)$ and $B(x, -1)$. then $AP = BP$.

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

$$x^2 - 6x + 9 + y^2 - 10y + 25 = x^2 + 2y + 1$$

$$x^2 - 6x + 9 = 12y - 24$$

$$(x-3)^2 = 12(y-2)$$

6. $x^2 - 10x - 16y - 7 = 0$

$$x^2 - 10x = 16y + 7$$

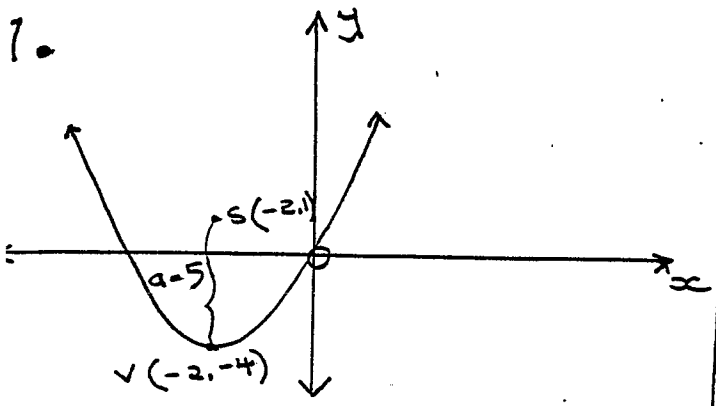
$$x^2 - 10x + 25 = 16y + 32$$

$$(x-5)^2 = 16(y+2)$$

Vertex = $(5, -2)$. Focal length = 4

Focus $(5, 2)$ Directrix $y = -6$

1.



$$(x + 2)^2 = 20(y + 4)$$

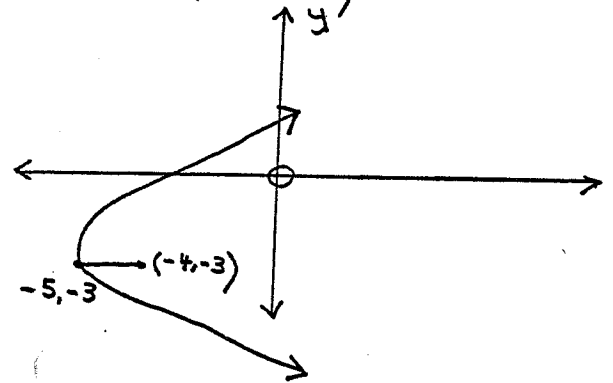
$$y^2 + 6y = 4x + 11$$

$$y^2 + 6y + 9 = 4x + 20$$

$$(y + 3)^2 = 4(x - 5)$$

a = 1.

Vertex (-5, -3)



Focus (-4, -3)

Directrix $x = -6$