Question

1. What is the equation of the parabola in the vertex form.

$$0 = y^2 - x - 4y + 3$$

$A: (x + 12)^2 = (y - 4)$

$B: (x + 1) = (y - 2)^2$

$C: (x - 1) = (y + 2)^2$

$D: (x - 3) = (y - 2)^2$

Solution:

$$y^2 - x - 4y + 3 = 0$$

$$(y^2 - 4y + 4) - 4 - x + 3 = 0$$

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

Answer: $B: (x + 1) = (y - 2)^2$.
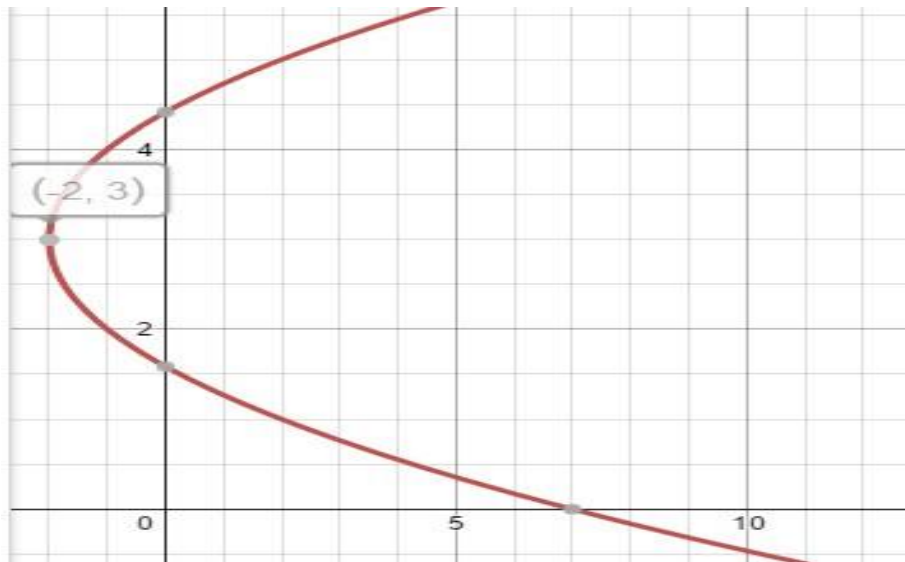
Question

2.   Graph the parabola. The graph scales 6 tall and 8 wide.

a) $(x+2) = (y-3)^2$ **b)** $(x-2)^2 = 4(y+3)$ **c)** $(x+3)^2 = 4(y+2)$ **d)** $(x-2) = -4(y-3)^2$
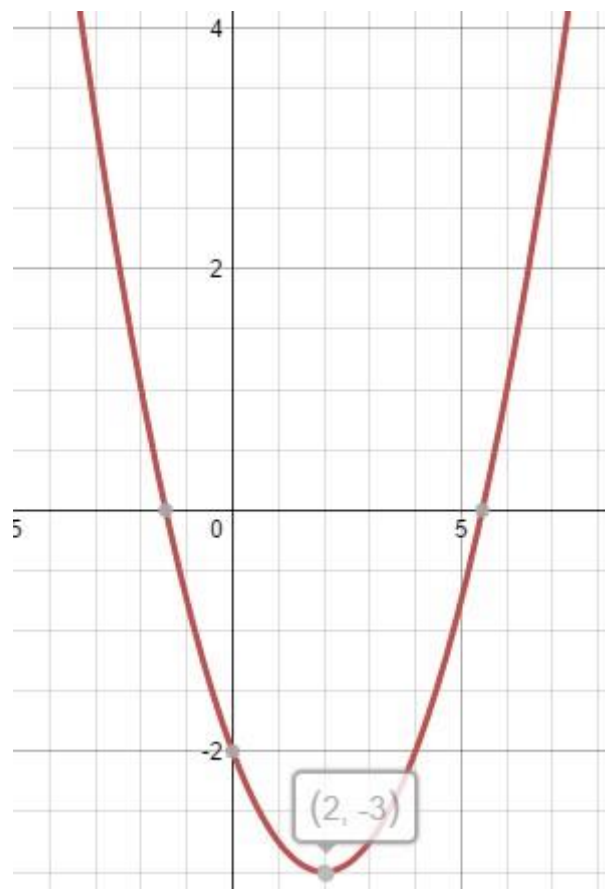
Solution

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

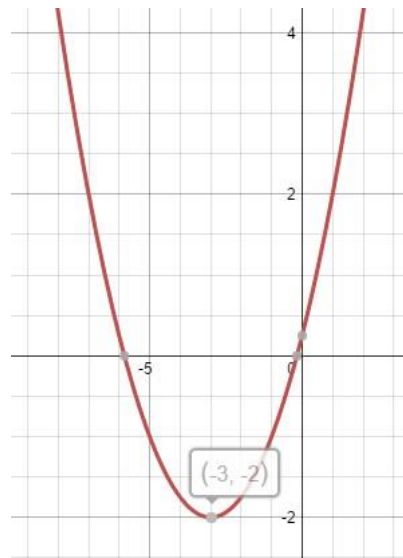This is a graph of horizontal parabola and it is shifted two units left and three units up.

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

This is a graph of vertical parabola and it is shifted two units right and three units down. The graph of the parabola is also compressed four times in the y-direction.
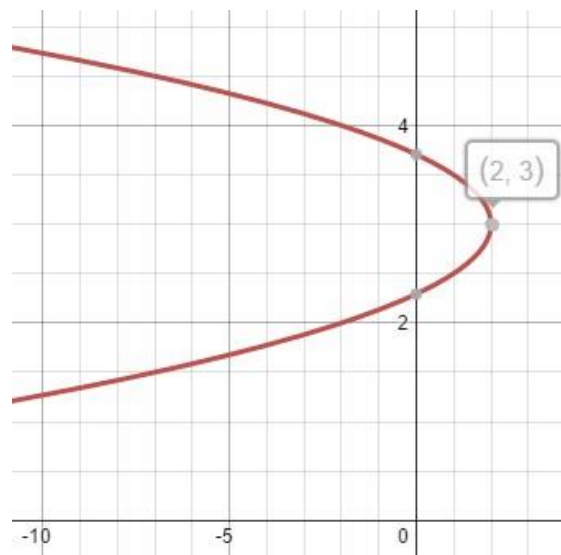

c) $(x + 3)^2 = 4(y + 2)$.

This is a graph of vertical parabola and it is shifted three units left and two units down. The graph of the parabola is also compressed four times in the y-direction.

d) $(x - 2) = -4(y - 3)^2.$

This is a graph of horizontal parabola and it is shifted two units right and three units up. The graph of the parabola is also compressed four times in the y-direction.

Question

3. What is the equation of the parabola, in vertex form, with vertex at (2, -4) and directrix $y = -6$?

A: $(y + 6)^2 = -8(x + 2)$

B: $(x + 2)^2 = 8(y + 4)$
C: $(x - 2)^2 = 8(y + 4)$
D: $(y + 4)^2 = 8(x - 2)$

Solution

If the equation of the parabola is $(x - h)^2 = 4p(y - k)$, then the vertex of this parabola is at (h, k), the directrix is the line $y = k - p$.

It is given that $h = 2$, $k = -4$, $k - p = -6$, that is, $-4 - p = -6$, hence

$p = 2$.

Because the equation of the parabola is $(x - h)^2 = 4p(y - k)$, the answer is

$(x - 2)^2 = 4 \cdot 2(y + 4)$,

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

Answer: C: $(x - 2)^2 = 8(y + 4)$.

Question

4. If the graph of the following parabola is shifted two units left and three units down, what is the resulting equation? $x = -8y^2$

A: $(x - 3) = -8(y + 2)^2$
B: $(x + 2) = -8(y + 3)^2$
C: $(x + 3) = -8(y - 2)^2$
D: $(x - 2) = -8(y - 3)^2$

Solution

First shift it two units left

$$x + 2 = -8y^2$$

Now we can shift it three units down

$$x + 2 = -8(y + 3)^2$$

Answer: B: $(x + 2) = -8(y + 3)^2$.