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Finding the Equation of a Parabola- Guided Lesson Explanation

Explanation # 1

Step 1) We should know what we have to be find out.

"Find the Equation of parabola?"

Step 2) The distance between (x_0,y_0) and $(0,-2)$ is $\sqrt{(x_0-0)^2+(y_0-(-2))^2}$

The distance between (x_0,y_0) and the directrix, $y=2$ is $|y_0=2|$

Equate the two distance expressions and square on both sides.

$\sqrt{(x_0-0)^2+\{(y_0-(-2)\}^2}=|y_0-2|$

$(x_0-0)^2+\{(y_0-(-2)\}^2=(y_0-2)^2$

Simplify and bring all terms to one side:

$x_0^2+8y_0=0$

Write the equation with y_0 on one side:

$$y_0=\frac{-x_0\,2}{8}$$

This equation in (x_0 , y_0) is true for all other values on the parabola and hence we can rewrite with (x , y).

So, the equation of the parabola with focus $(0,-2)$ and directrix is $y=2$is

$$y=\frac{-x^2}{8}$$

Step 3) So the answer is $y=\frac{-x^2}{8}$

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Explanation # 2

Step 1) We should know what we have to be find out.

"Find the Equation of parabola?"

Step 2) The distance between (x_0,y_0) and $(5,-1)$ is $\sqrt{(x_0-5)^2+(y_0-(-1))^2}$

The distance between (x_0,y_0) and the directrix, $y=3$ is $|y_0=3|$

Equate the two distance expressions and square on both sides.

$\sqrt{(x_0-5)^2+(y_0-(-1))^2}=|y_0-3|$

$(x_0-5)^2+(y_0-(-1))^2=(y_0-3)^2$

Simplify and bring all terms to one side:

$x_0^2-10x_0+17+8y_0=0$

Write the equation with y_0 on one side:

$y_0=-\frac{x_0 2}{8}+\frac{5}{4}x_0-\frac{17}{8}$

This equation in (x_0 , y_0) is true for all other values on the parabola and hence we can rewrite with (x , y).

So, the equation of the parabola with focus (5,-1) and directrix is $y=3$is

$y=-\frac{x\ 2}{8}+\frac{5}{4}x-\frac{17}{8}$

Step 3) So the answer is $y=-\frac{x\ 2}{8}+\frac{5}{4}x-\frac{17}{8}$

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Explanation # 3

Step 1) We should know what we have to be find out.

"Find the Equation of parabola?"

Step 2) The distance between (x_0,y_0) and $(4,-4)$ is $\sqrt{(x_0-4)^2+(y_0-(-4))^2}$

The distance between (x_0,y_0) and the directrix, $y=6$ is $|y_0-6|$.

Equate the two distance expressions and square on both sides.

$\sqrt{(x_0-4)^2+(y_0-(-4))^2}=|y_0-6|$

$(x_0-4)^2+(y_0-(-4))^2=(y_0-6)^2$

Simplify and bring all terms to one side:

$x_0^2-8x_0-4+20y_0=0$

Write the equation with y_0 on one side:

$y_0 = -\frac{x_0 2}{20}+\frac{2}{5}x_0+\frac{1}{5}$

This equation in (x_0 , y_0) is true for all other values on the parabola and hence we can rewrite with (x , y).

So, the equation of the parabola with focus $(4,-4)$ and directrix is $y=6$is

$y = -\frac{x 2}{20}+\frac{2}{5}x+\frac{1}{5}$

Step 3) So the answer is $y = -\frac{x 2}{20}+\frac{2}{5}x+\frac{1}{5}$