

Pre-Calculus Notes

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Section 10.2 - Parabolas Day 2

Parametric Form of Parabola Equations:

$4c(y-k) = (x-h)^2$ becomes $x = T$ and $y = \frac{1}{4c}(T-h)^2 + k$ in parametric form.

$4c(x-h) = (y-k)^2$ becomes $x = \frac{1}{4c}(T-k)^2 + h$ and $y = T$ in parametric form.

Why would we even want to deal with parametric form of the parabola?

Graph $16(x+3) = (y-1)^2$ on your graphing calculator.

have to get y by itself!

$$\sqrt{16(x+3)} = \sqrt{(y-1)^2}$$

$$y-1 = \pm \sqrt{16(x+3)}$$

$$y = 1 \pm \sqrt{16(x+3)}$$

} extra work!

reminder about
mode: PAR
and think
about your
1 step!

Example 1: Rewrite each parabola in standard form AND parametric form.

a. $y = -\frac{1}{8}x^2 + 2$

$$y-2 = -\frac{1}{8}x^2$$

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

$$x = T$$

$$y = -\frac{1}{8}T^2 + 2$$

b. $y^2 - 2x + 2y + 7 = 0$

$$y^2 + 2y + \underline{1} = 2x + 7 + \underline{1}$$

$$(y+1)^2 = 2x + 8$$

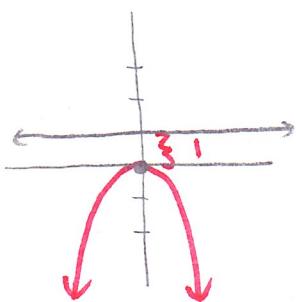
$$(y+1)^2 = 2(x+4)$$

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

$$y = T$$

Example 2: Write the equation of the parabolas in both standard AND parametric form given the following information.

a. Vertex at the origin and directrix $y = 1$



opens down

$$c = -1$$

$$x^2$$

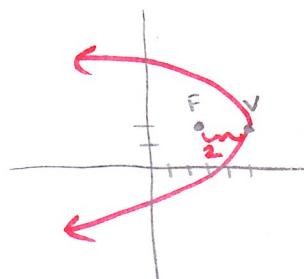
$$4c(y-k) = (x-h)^2$$

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

$$x = T$$

$$y = -\frac{1}{4}T^2$$

b. Vertex at $(5, 2)$ and focus $(3, 2)$



opens left

$$c = -2$$

$$y^2$$

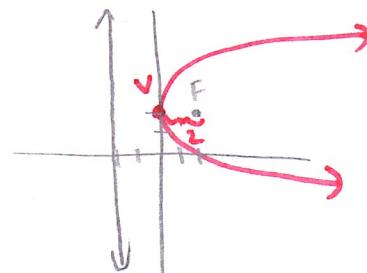
$$4c(x-h) = (y-k)^2$$

$$-8(x-5) = (y-2)^2$$

$$x = -\frac{1}{8}(T-2)^2 + 5$$

$$y = T$$

c. Focus at $(2, 2)$ and directrix $x = -2$



$$\text{vertex } (0, 2)$$

opens right

$$c = 2$$

$$y^2$$

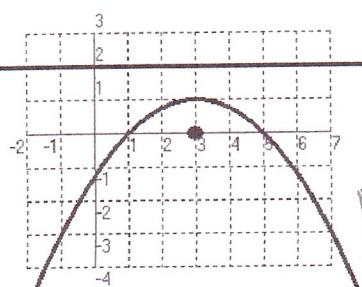
$$4c(x-h) = (y-k)^2$$

$$8(x-0) = (y-2)^2$$

$$x = \frac{1}{8}(T-2)^2$$

$$y = T$$

d.



opens down

$$c = -1 \quad x^2$$

$$\text{vertex } (3, 1)$$

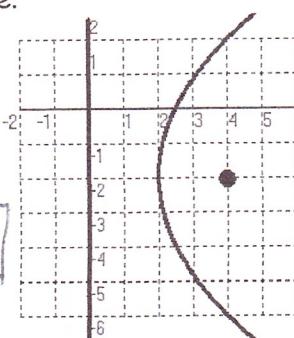
$$4c(y-k) = (x-h)^2$$

$$-4(y-1) = (x-3)^2$$

$$x = T$$

$$y = -\frac{1}{4}(T-3)^2 + 1$$

e.



opens right

$$c = 2 \quad y^2$$

$$\text{vertex } (2, -2)$$

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

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

$$x = \frac{1}{8}(T+2)^2 + 2$$

$$y = T$$