M-CT Calculus & Trig 5/2

1.) $4x^2 + 8y^2 = 30$

ellipse

$\frac{2x^2}{15} + \frac{4y^2}{15} = 1$

$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$

2.) $2y^2 - x^2 = 16$

hyperbola

$\frac{2y^2}{16} - \frac{x^2}{16} = \frac{16}{16}$

$\frac{y^2}{8} - \frac{x^2}{16} = 1$

3.) $\frac{x^2}{2} + \frac{y^2}{2} = 5$

circle

$x^2 + y^2 = 10$

$(x-h)^2 + (y-k)^2 = r^2$

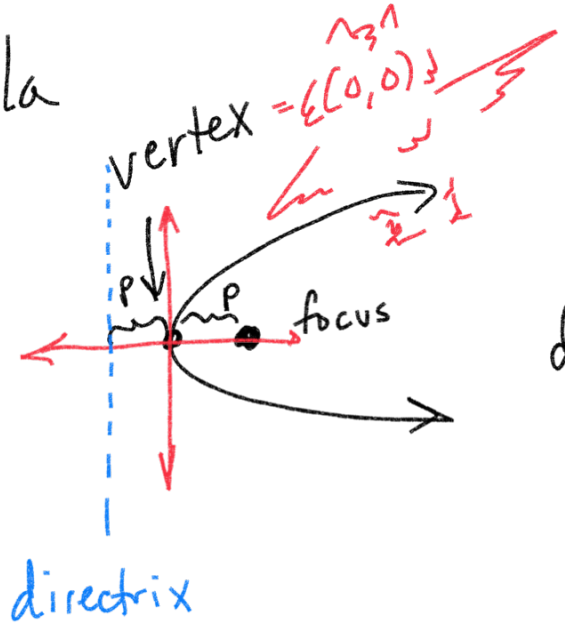
4.) $y^2 - 2x = 6$

parabola

$y^2 = 2x + 6$

$x = \frac{y^2}{2} + 3$

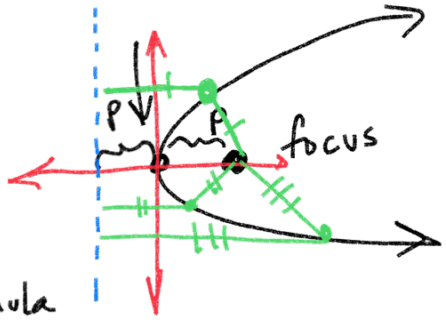
The Parabola



vertex: (0,0)

focus: (p, 0)

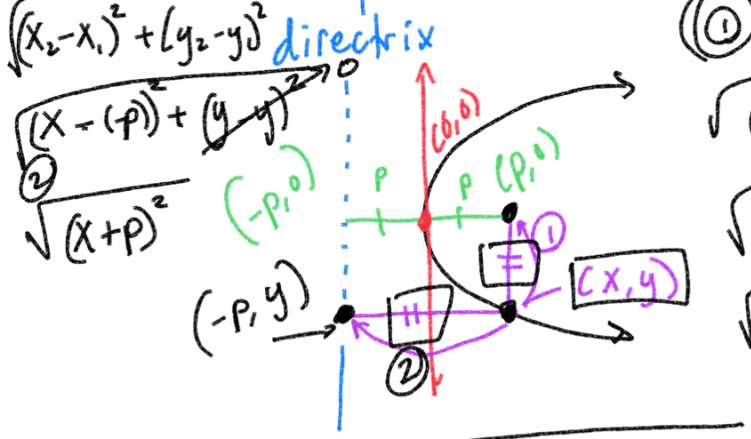
directrix: $x = -p$



A parabola is a line that is equidistant from the focus and directrix.

Distance Formula

$\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$



$\sqrt{(x-(-p))^2+(y-y)^2}$

$\sqrt{(x+p)^2}$

① Distance formula

$\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

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

$\sqrt{(x-p)^2+y^2}$

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

$$(x+p)^2 = \left(\sqrt{(x-p)^2+y^2}\right)^2$$

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

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

$$x^2+xp+xp+p^2 = x^2-xp-xp+p^2+y^2$$

$$x^2+2xp+p^2 = x^2-2xp+p^2+y^2$$

$$-x^2+2xp-p^2 \quad -x^2+2xp-p^2$$

$$\boxed{4xp = y^2}$$ equation for a parabola

What is the equation for a parabola with a focus at (3,0) and a vertex at (0,0)

$p = 3$

$y^2 = 4x(3) = \boxed{y^2 = 12x}$

Parabola $x^2 = 8y$

$x^2 = 4yp$

$\frac{4p}{4} = \frac{8}{4}$

$p = 2$

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

$p =$ ordered pair for focus : $(0,2)$

equation for directrix

$y = -2$

(h,k) : vertex

$y^2 = 4px$

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

$x^2 = 4py$

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