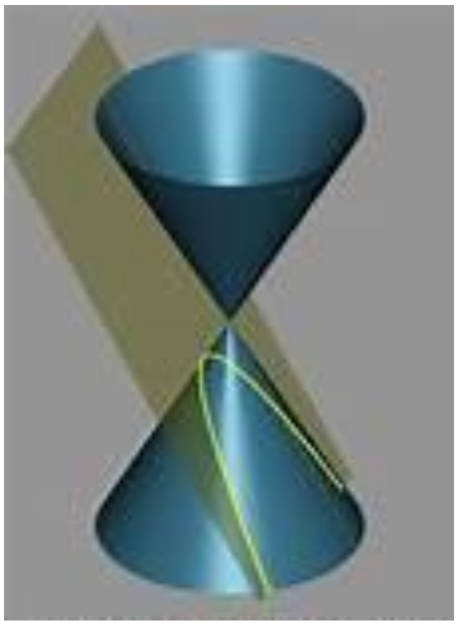
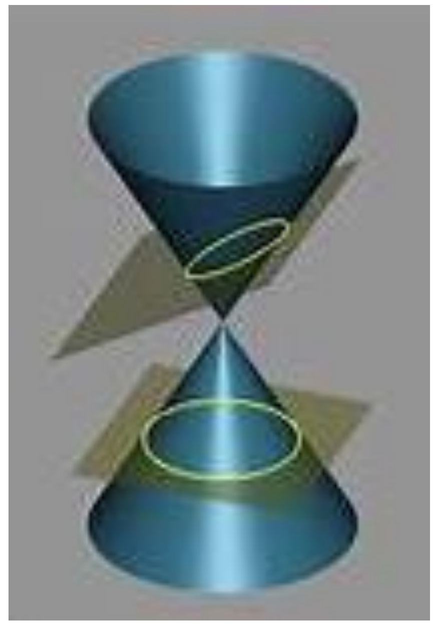
Conic Sections:

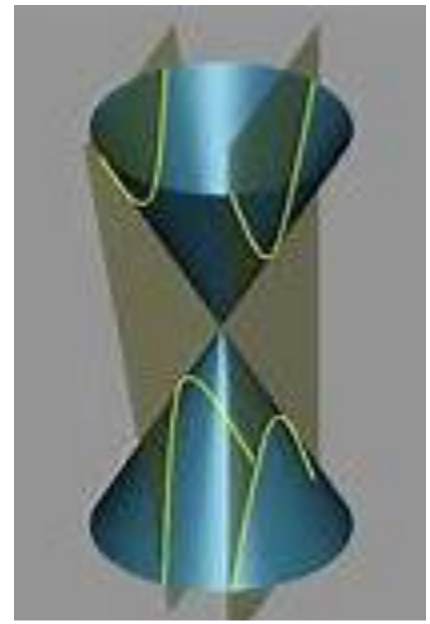
Curves formed by the intersection of a plane with a double cone.



Parabola



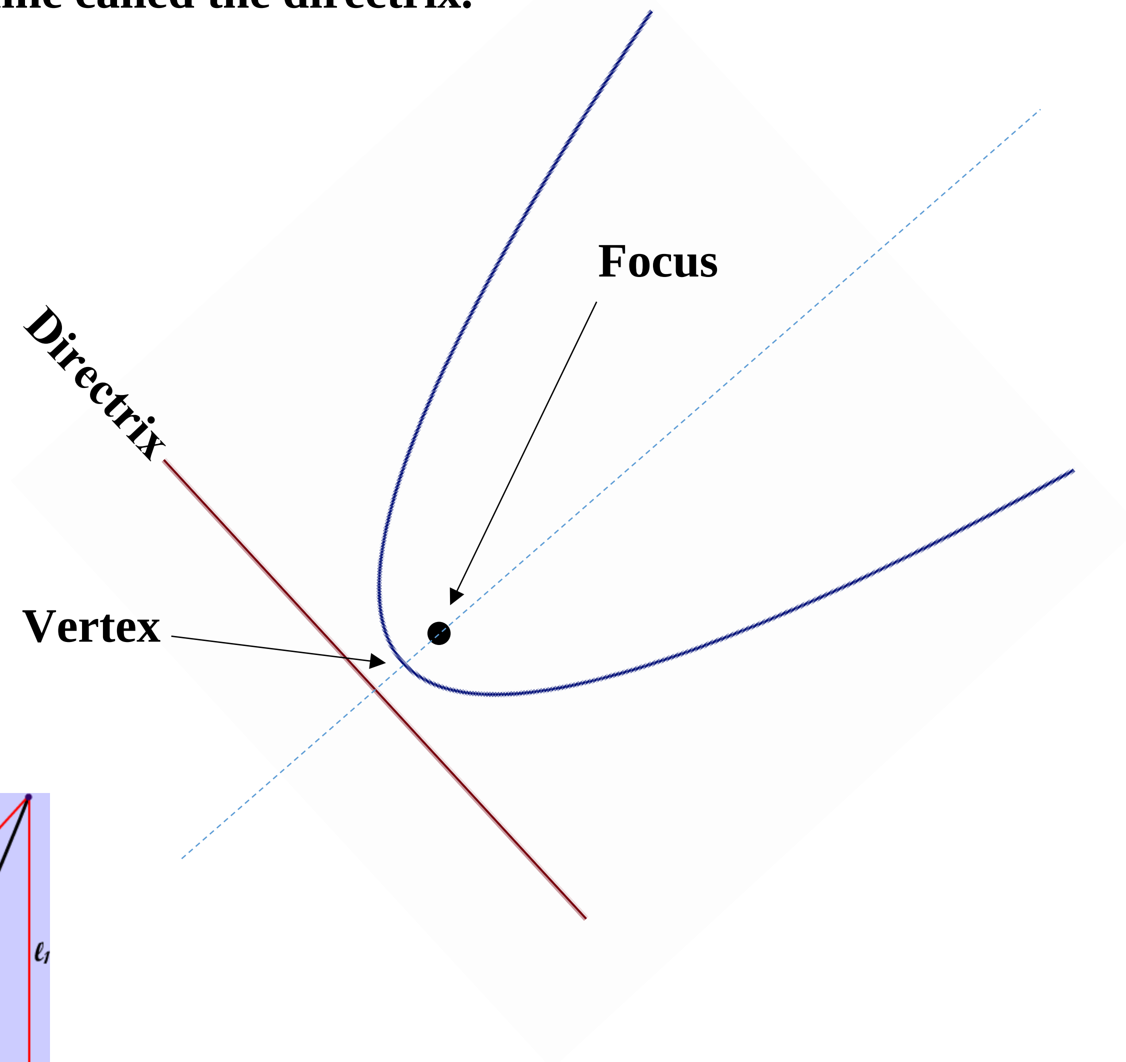
Ellipse or Hypobola

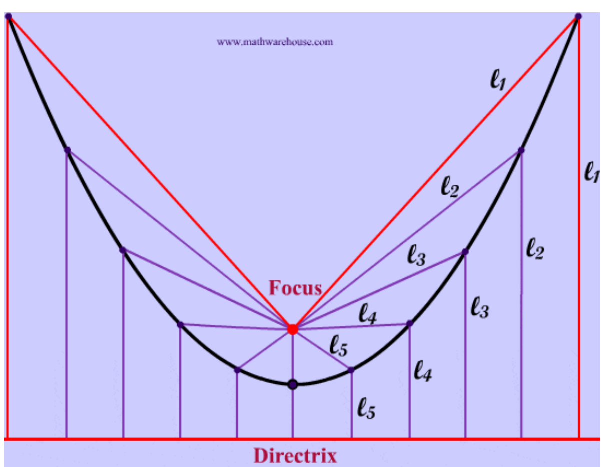


Hyperbola

<u>Parabola:</u>

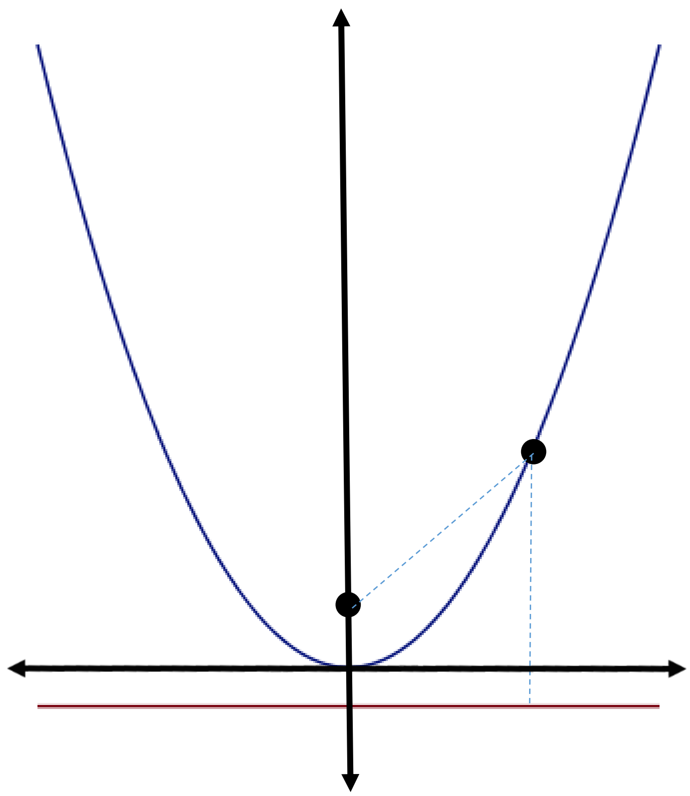
It's the set of points in the plane that are equidistant from a fixed point called the focus and a fixed line called the directrix.





<u>Vertical Parabolas with Vertex at the Origin:</u>

The focus will be at $\left(0,a\right)$ with $a>0$, and the directrix will be $y=-a$.



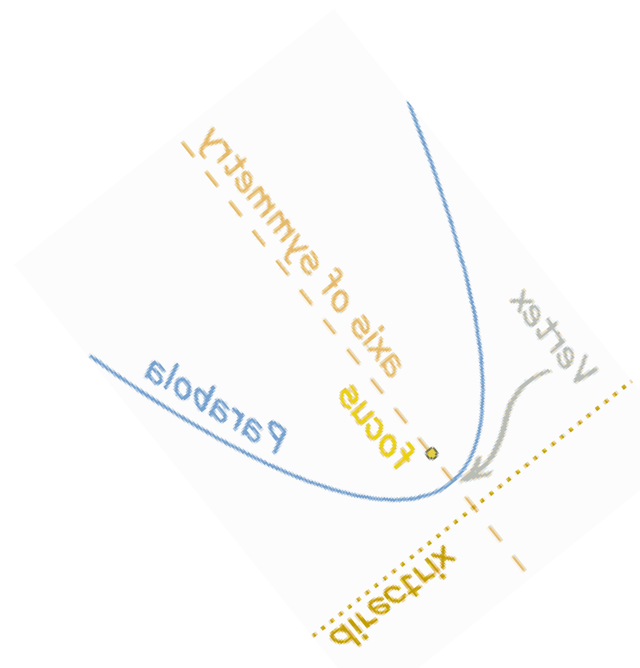
$$\sqrt{(x-0)^2+(y-a)^2}=y+a$$

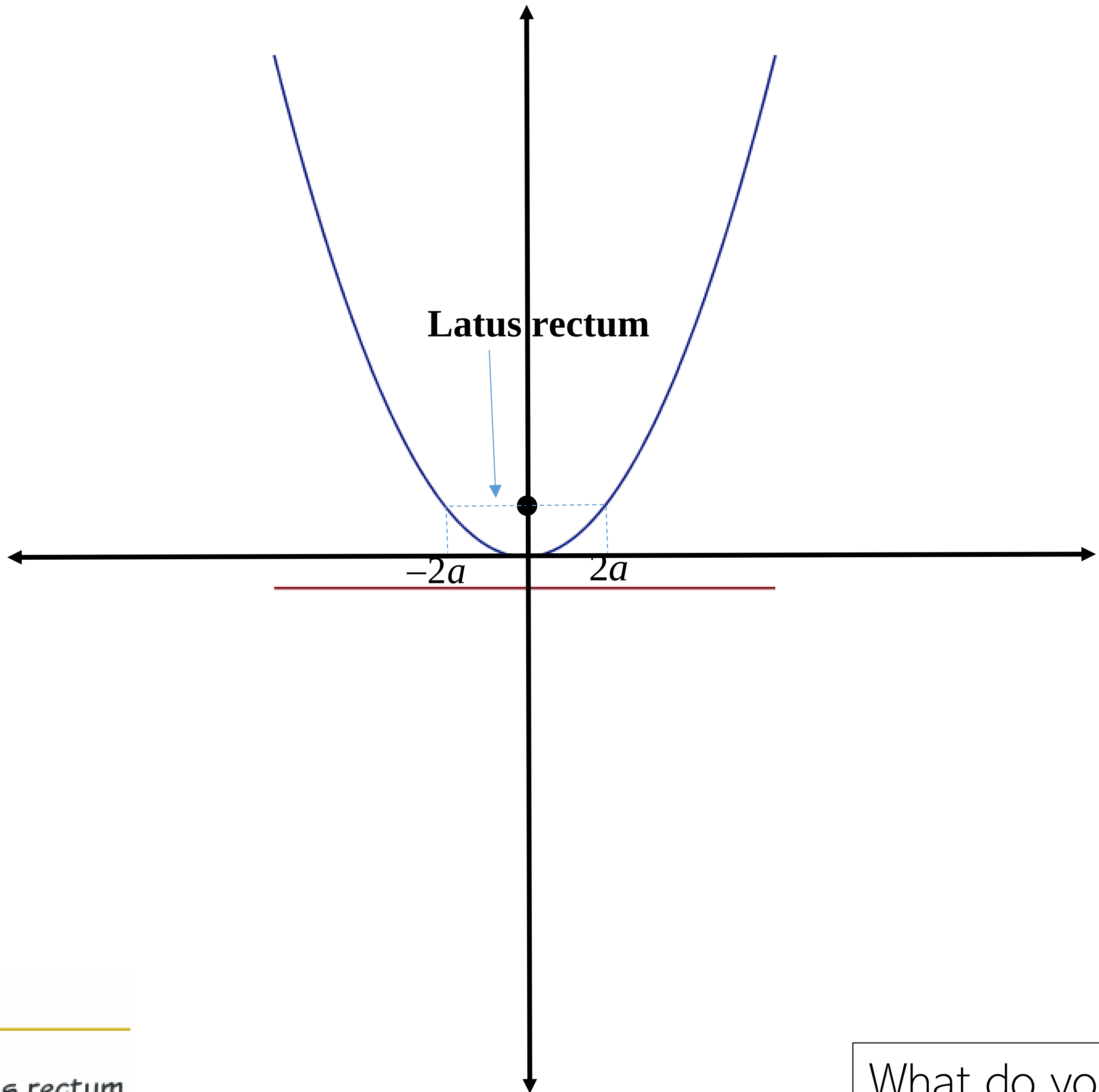
$$x^2+(y-a)^2=(y+a)^2$$

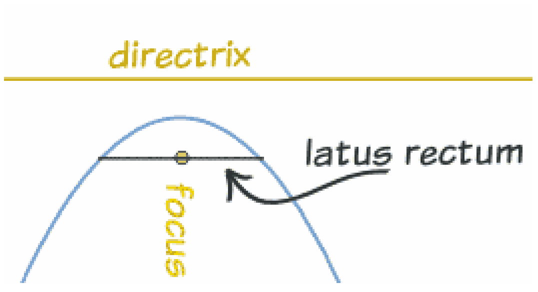
$$x^2+y^2-2ay+a^2=y^2+2ay+a^2$$

$$x^2-2ay=2ay$$

$$x^2=4ay$$







What do you get from eating too much salad?

Sketch the graph of the parabola with the equation $x^2 = 8y$.

For a vertical parabola with vertex at the origin that opens down, the equation can be written as $x^2 = -4ay$ with $a > 0$, and the focus at $(0, -a)$ and the directrix $y = a$.

Sketch the parabola with the equation $x^2 = -16y$.

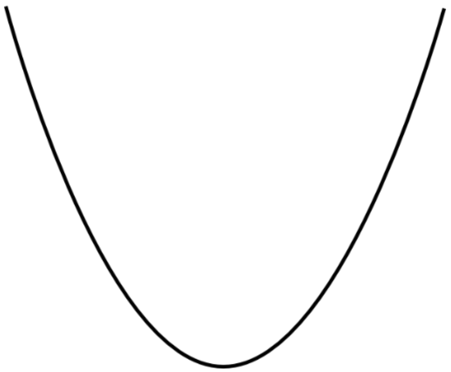
Similarly, for horizontal parabolas, the equations are(right parabola) $y^2 = 4ax$**, with focus at** $(a, 0)$ **and directrix** $x = -a$**, and (left parabola)** $y^2 = -4ax$**, with focus at** $(-a, 0)$ **and directrix** $x = a$**.**

Sketch the graph of the parabola with the equation $y^2 = 4x$**.**

Sketch the graph of the parabola with the equation $y^2 = -6x$**.**

For parabolas with vertices at (h,k), the equations are

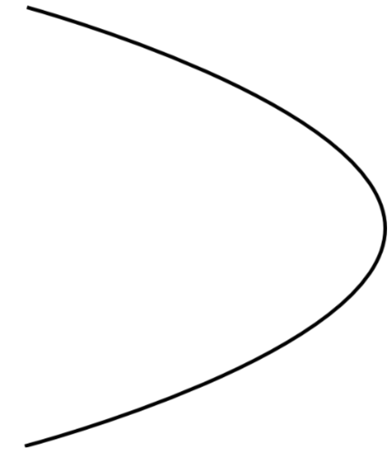
$$(x-h)^2 = 4a(y-k)$$
$$(x-h)^2 = -4a(y-k)$$
$$(y-k)^2 = 4a(x-h)$$
$$(y-k)^2 = -4a(x-h)$$



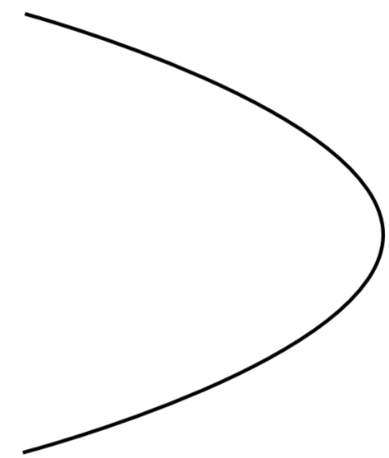
Sketch the following parabolas:

1. $(x-4)^2 = 16(y+2)$

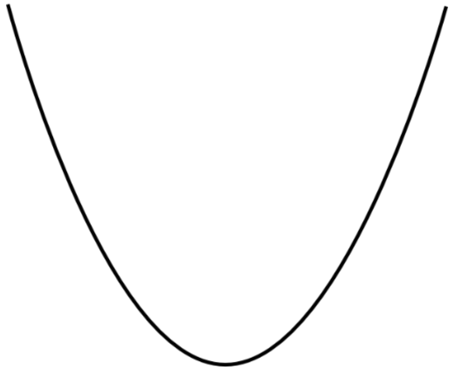
2. $(y+1)^2 = -4(x-2)$



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

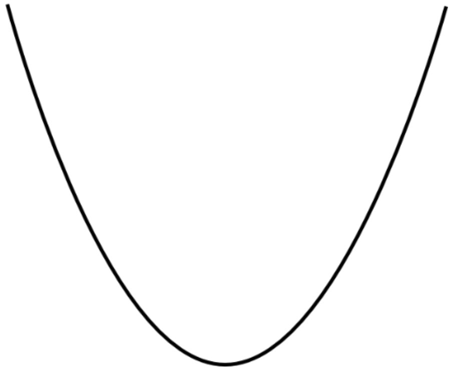


4. $x^2 + 8x = 4y - 8$

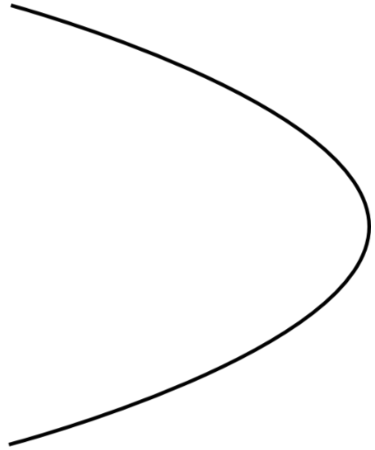


Find equations for the following parabolas:

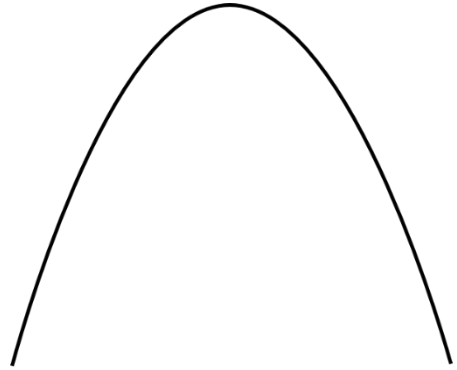
1. Focus: $(0,2)$ **and Vertex:** $(0,0)$



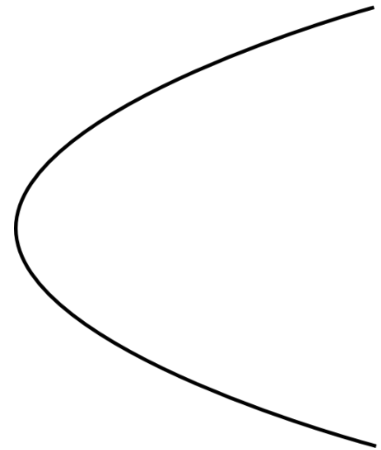
2. Focus: $(-4,0)$ **and Vertex:** $(0,0)$



3. Focus: $(0,-1)$ **and Directrix:** $y=1$



4. Focus: $(6,-2)$ **and Vertex:** $(4,-2)$



5. Focus: $(-4,4)$ **and Directrix:** $y=-2$