I. We discussed the material on hyperbolas that I added at the end of yesterday's notes.

II. §10.2: Eccentricity (681)

A. A circle is an ellipse w/ $c = 0$.

Now, what is $c$?

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \quad (a > b)$$

$$c = \sqrt{a^2 - b^2}$$

So if $c = 0$, then $a^2 = b^2$

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

Clear fractions $x^2 + y^2 = a^2$ $\iff$ Graph is a circle $C(0,0)$ $r = a$

B. If $c = a$,

$$a = \sqrt{a^2 - b^2} \quad a^2 = a^2 - b^2 \quad b = 0$$

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \quad b^2 x^2 + a^2 y^2 = a^2 b^2$$

$$a^2 y^2 = 0 \quad y = 0$$

But Graph of $y = 0$ is $x$-axis!

"Ellipse II is just a line segment."
\[ e = \frac{c}{a} \quad \text{For ellipse: } e = \frac{\sqrt{a^2 - b^2}}{a} \]

Eccentricity.

\[ e = \frac{\sqrt{a^2 + b^2}}{a} \quad \text{For hyperbola} \]

Woops! Nobody has read my stuff about the PARABOLA — so we have to "review."
opens to the RIGHT. And if you end up with this parabola opens to the left.

\[ y^2 = -4px \] (4)

3. So the form (1), (2), (3), or (4) tells you which way the parabola OPENS.
And it seems like the larger the number \( p \) becomes, the wider the parabola opens. Try it on your graphing calculator with a Type (1) parabola and \( p = 1, 2, 3 \)

\[ x^2 = 4py \] so \( y = x^2/(4p) \)

4. The "p" also gives us the information needed to locate the focus \( F \) and the directrix \( L \).

\[ F(0, p) \text{ or } F(0, -p) \text{ or } F(p, 0) \text{ or } F(-p, 0) \text{ and } L: y = -p \text{ or } y = p \]

5. Example: Find the eq. for the parabola with vertex at the origin and with directrix \( x = 12 \). Also Graph it neatly.

Sol: (a) If directrix : \( x = 12 \) and V(0,0) is the vertex, then I conclude that the parabola opens to the \( \text{left} \) \( \& \ F(-12, 0) \) is the focus. \( \therefore \) The parabola is Type (4)

\[ y^2 = -4px \]

(b) \( p = 12 \), so \( y^2 = -48x \) is the Std. Form eq. for the parabola.

(c) I'll leave it to YOU to graph it! \[ \boxed{\text{I}} \]

\[ \boxed{\text{I}} \]