AP Calculus BC
Chapter 12 (Anton) Review

The General Equation for a Conic Section: $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$

Rotate Axes:

$$\cot 2\theta = \frac{A-C}{B}$$

$$x = x'\cos\theta - y'\sin\theta$$
$$y = x'\sin\theta + y'\cos\theta$$

The type of section can be found from the sign of the <u>Discriminant</u>: *B² - 4AC*

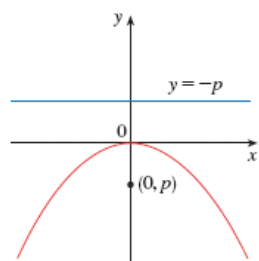| If B^2 - $4AC$ is...	then the curve is a...
< 0	ellipse, circle, point or no curve.
= 0	parabola, 2 parallel lines, 1 line or no curve.
> 0	hyperbola or 2 intersecting lines.

The Conic Sections. For any of the below with a center/vertex (h, k) instead of (0, 0), replace each x term with (x-h) and each y term with (y-k).

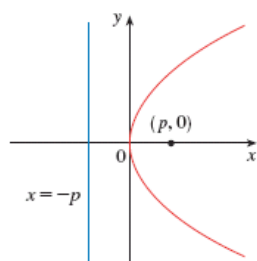|	**Circle**	**Ellipse ($a > b$)**	**Parabola**	**Hyperbola**
Equation (horiz. vertex):	$x^2 + y^2 = r^2$	$\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$	$y^2 = 4px$	$\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$
Equations of Asymptotes:				$y = \pm\dfrac{b}{a}x$
Equation (vert. vertex):	$x^2 + y^2 = r^2$	$\dfrac{x^2}{b^2} + \dfrac{y^2}{a^2} = 1$	$x^2 = 4py$	$\dfrac{y^2}{a^2} - \dfrac{x^2}{b^2} = 1$
Equations of Asymptotes:				$y = \pm\dfrac{a}{b}x$
Variables:	r = circle radius	a = major radius (= 1/2 length major axis) b = minor radius (= 1/2 length minor axis) c = distance center to focus	p = distance from vertex to focus (or directrix)	a = 1/2 length major axis b = 1/2 length minor axis c = distance center to focus
Eccentricity:	0	$\dfrac{c}{a}$		$\dfrac{c}{a}$
Relation to Focus:		$c^2 = a^2 - b^2$		$c^2 = a^2 + b^2$
Definition: is the locus of all points which meet the condition...	distance to the origin is constant	sum of distances to each focus is constant	distance to focus = distance to directrix	difference between distances to each foci is constant

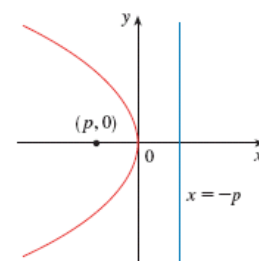(a) $x^2 = 4py,\ p > 0$

(b) $x^2 = 4py,\ p < 0$

(c) $y^2 = 4px,\ p > 0$
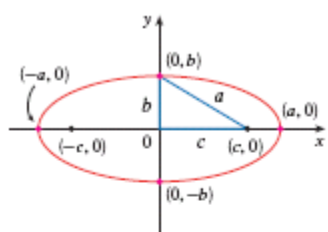
(d) $y^2 = 4px,\ p < 0$

FIGURE 8
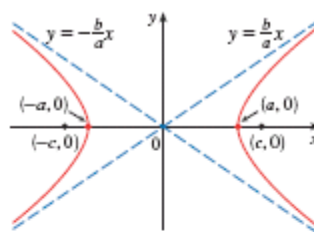$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

FIGURE 12
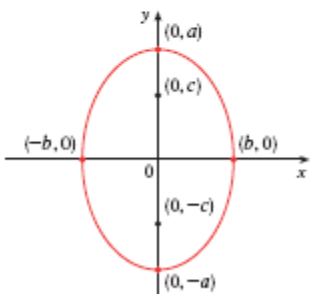$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$
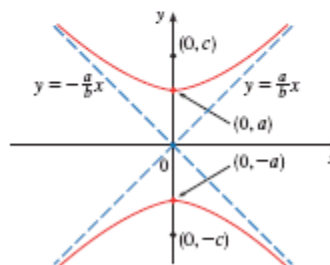
FIGURE 9
$$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1,\ a \geq b$$

FIGURE 13
$$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$$