

Name: _____

Date: _____

Period: _____

Pre-Calculus: Intro to Conics

Conic Sections:

Name

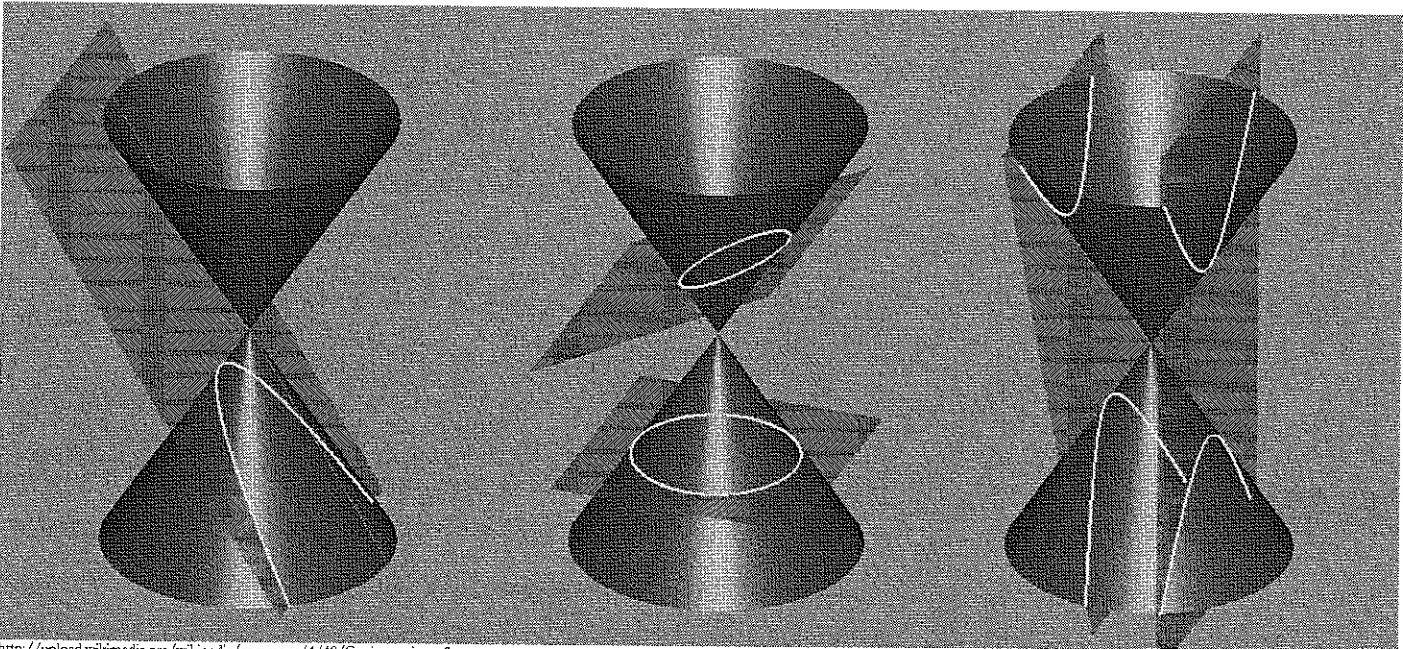
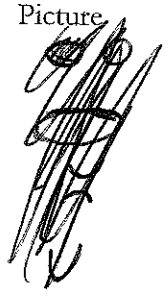
Picture

1. Circle

2. Ellipse

3. Hyperbola

4. Parabola



http://aplcsd.wikimedia.org/wiki/Conic_sections_2.png

These graphs are called conic sections. A plane cutting, or sectioning a cone forms conics. They are relations whose equations are quadratics with two variables.

The general form of a conic section is $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$

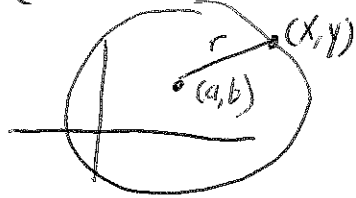
To recognize conic sections from this equation, follow these general rules: (***) for these rules to apply, $B=0$

- 1. The conic is Circle if x^2 and y^2 have equal coefficients.
- 2. The conic is Ellipse if x^2 and y^2 have unequal coefficients, but the same sign.
- 3. The conic is Hyperbola if x^2 and y^2 have opposite signs.
- 4. The conic is Parabola if only one of the two variables is squared.

Now Practice! Identify the conic.

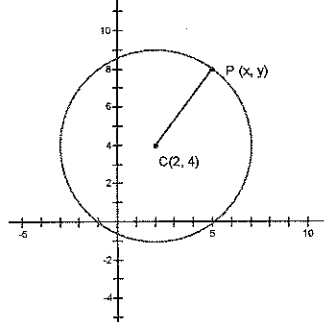
- 1. $x^2 + 4y^2 + 5x + 6y = 100$ Ellipse
- 2. $x^2 - 4y^2 + 5x + 6y = 100$ Hyperbola
- 3. $-x^2 + 4y^2 + 5x + 6y = 100$ Hyperbola
- 4. $4x^2 + 4y^2 + 5x + 6y = 100$ Circle
- 5. $4x^2 + 5x + 6y = 100$ Parabola
- 6. $4y^2 + 5x + 6y = 100$ Parabola

Derive Circle Formula



The set of all points $P(x, y)$ in the plane that are 5 unit from the point $C(2, 4)$ is a circle

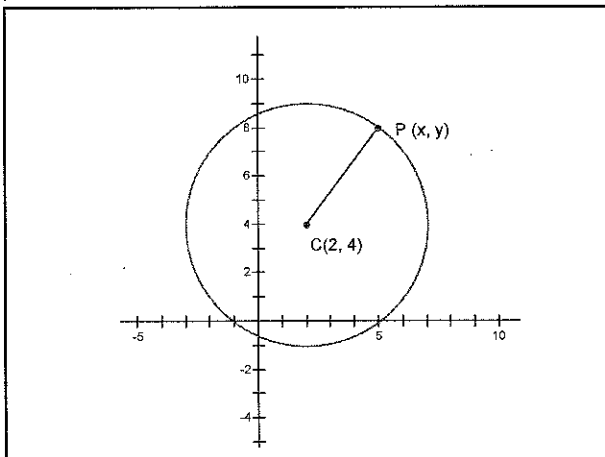
Find the equation of the circle



Use your Distance Formula!!

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

What do you know that the distance of CP has to be?



In General

If $P(x, y)$ is on the circle with center $C(h, k)$ and radius r , then:

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

Write the equation of the circle:

- Center (0, 0) and Radius = 4
- Center (-1, 7) and Radius = 3
- Center (4, -4) and Radius = 9
- Center (-3, -10) and Radius = 6

→ $(x+1)^2 + (y-7)^2 = 3^2$
→ $(x-4)^2 + (y+4)^2 = 9^2$
→ $(x+3)^2 + (y+10)^2 = 6^2$

Find the Center and Radius for each of the following 4 equations

① $(x-4)^2 + (y-2)^2 = 16$

② $(x+5)^2 + (y-1)^2 = 20$

③ $(x-9)^2 + y^2 = 48$

④ $x^2 - 6x + y^2 + 20y + 84 = 0$

② $C = (-5, 1) \quad r = 2\sqrt{5}$

③ $C = (9, 0) \quad r = 4\sqrt{3}$

④ ✓

$$x^2 - 6x + y^2 + 20y + 84 = 0$$

We need to COMPLETE THE SQUARE!!!

$$x^2 - 6x + y^2 + 20y + 84 = 0$$

$$x^2 - 6x + y^2 + 20y = -84$$

$$x^2 - 6x + 9 + y^2 + 20y + 100 = -84 + 9 + 100$$

$$(x-3)^2 + (y+10)^2 = 25$$

$$C = (3, -10) \quad r = 5$$

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Pre-Calculus: 6.2 Circles Extra Practice

Directions: Complete the square for the following conics in standard form. After writing the equation in (h, k) form, identify the center, radius, and draw a sketch.

Follow these steps!!

1. Group like terms together and move the constant to the other side.
2. Complete the square for x and y.
(Take half of the coefficient of x and y, square it, and add it to both sides)
*You may not always complete the square for both x and y!
3. Factor each perfect square trinomial to a binomial squared.
4. Identify the center, radius, and draw a sketch of the graph.

EXAMPLE :

$$x^2 - 6x + y^2 + 20y + 84 = 0$$

$$x^2 - 6x + y^2 + 20y = -84$$

$$x^2 - 6x + 9 + y^2 + 20y + 100 = -84 + 9 + 100$$

$$x^2 - 6x + 9 + y^2 + 20y + 100 = 25$$

$$(x-3)^2 + (y+10)^2 = 25$$

Center : (3, -10)

Radius : 5

1. $x^2 - 8x + y^2 - 2y + 13 = 0$

$$x^2 - 8x + 16 + y^2 - 2y + 1 = -13 + 16 + 1$$

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

2. $x^2 + 6x + y^2 - 7 = 0$

$$x^2 + 6x + 9 + y^2 = 7 - 9$$

$$(x+3)^2 + y^2 = -2$$

3. $x^2 + y^2 - 100 = 0$

$$x^2 + y^2 = 100$$

4. $x^2 + 8x + y^2 + 14y + 55 = 0$

$$x^2 + 8x + 16 + y^2 + 14y + 49 = -55 + 16 + 49$$

$$(x+4)^2 + (y+7)^2 = 10$$

$$5. x^2 + 10x + y^2 - 2y - 118 = 0$$

$$X^2 + 10X + 25 + y^2 - 2y + 1 = 118 + 26$$

$$(X+5)^2 + (y-1)^2 = 144$$

$$6. x^2 - 12x + y^2 - 4y + 4 = 0$$

$$X^2 - 12X + 36 + y^2 - 4y + 4 = -4 + 4 + 36$$

$$(X-6)^2 + (y-2)^2 = 36$$

$$7. x^2 + 10x + y^2 - 14y + 49 = 0$$

$$X^2 + 10X + 25 + y^2 - 14y + 49 = 0$$

$$(X+5)^2 + (y-7)^2 = 25$$

$$8. x^2 - 18x + y^2 - 6y + 9 = 0$$

$$X^2 - 18X + 81 + y^2 - 6y + 9 = 81$$

$$(X-9)^2 + (y-3)^2 = 81$$

$$9. x^2 + 4x + y^2 + 12y + 39 = 0$$

$$X^2 + 4X + 4 + y^2 + 12y + 36 = -39 + 36 + 4$$

$$(X+2)^2 + (y+6)^2 = 1$$

$$10. x^2 - 16x + y^2 + 24y + 199 = 0$$

$$X^2 - 16X + 64 + y^2 + 24y + 144 = -199 + 144 + 64$$

$$(X-8)^2 + (y+12)^2 = 9$$