

Identifying Parts on a Conic from the Equation

You know how to determine the parts of a conic using the graph, now we'll learn how to find them from the equation.

<p style="text-align: center;">Standard Equation of an Ellipse</p> <p>$(h, k) \rightarrow h$ is always being subtracted from x k is always being subtracted from y a is the square root of the "winning" denominator. b is the square root of the "losing" denominator.</p> <p>Example:</p> $\frac{(x-3)^2}{9} + \frac{(y+7)^2}{16} = 1$ <p>h is subtracted from x, so... $x - h = x - 3$ $-h = -3$ $h = 3$</p> <p>k is subtracted from y, so... $y - k = y + 7$ $-k = 7$ $k = -7$</p> <p>$(h, k) = \boxed{(3, -7)}$</p> <p>The "winning" denominator is 16, and a is the square root of the "winning" denominator, so... $a = \sqrt{16} = \boxed{4}$</p> <p>The "losing" denominator is 9, and b is the square root of the "losing" denominator, so... $b = \sqrt{9} = \boxed{3}$</p>	<p style="text-align: center;">Standard Equation of a Hyperbola</p> <p>$(h, k) \rightarrow h$ is always being subtracted from x k is always being subtracted from y a is the square root of the "winning" denominator. b is the square root of the "losing" denominator.</p> <p>Example:</p> $\frac{(y-2)^2}{25} - \frac{(x+6)^2}{36} = 1$ <p>h is subtracted from x, so... $x - h = x + 6$ $-h = 6$ $h = -6$</p> <p>k is subtracted from y, so... $y - k = y - 2$ $-k = -2$ $k = 2$</p> <p>$(h, k) = \boxed{(-6, 2)}$</p> <p>The "winning" denominator is (+)25, and a is the square root of the "winning" denominator, so... $a = \sqrt{25} = \boxed{5}$</p> <p>The "losing" denominator is (-)36, and b is the square root of the "losing" denominator, so... $b = \sqrt{36} = \boxed{6}$</p>
<p style="text-align: center;">Standard Equation of a Circle</p> <p>$(h, k) \rightarrow h$ is always being subtracted from x k is always being subtracted from y r is the square root of the constant (the number) on the right side of the equal sign.</p> <p>Example:</p> $(x+5)^2 + y^2 = 100$ <p>h is subtracted from x, so... $x - h = x + 5$ $-h = 5$ $h = -5$</p> <p>k is subtracted from y, but there's nothing there. Normally, we see $(y+3)^2$, or something like it. Here, it's just y^2. This means we're working with $(y)^2$, and the inside is just y. So... $y - k = y$ (Subtract y from both sides $\frac{-y}{-y}$) $-k = 0$ $k = 0$</p> <p>$(h, k) = \boxed{(-5, 0)}$</p> <p>The constant on the right side of the equal sign is 100, and r is the square root of the constant, so... $r = \sqrt{100} = \boxed{10}$</p>	<p style="text-align: center;">Standard Equation of a Parabola</p> <p>$(h, k) \rightarrow h$ is always being subtracted from x k is always being subtracted from y p is a bit more complicated than the parts of other conics. *****</p> <p>$p \rightarrow$ <u>If the coefficient is in front of the non-squared binomial, just divide the coefficient by 4.</u></p> <p>Example:</p> $-22(y-2) = (x+5)^2$ <p>h is subtracted from x, so... $x - h = x + 5$ $-h = 5$ $h = -5$</p> <p>k is subtracted from y, so... $y - k = y - 2$ $-k = -2$ $k = 2$</p> <p>$(h, k) = \boxed{(-5, 2)}$</p> <p>-22 is the number before $(y-2)$, which isn't squared, & p is the number before the non-squared set divided by 4. So... $p = -22 \div 4 = -\frac{22}{4} = \boxed{-\frac{11}{2}}$ *****</p> <p>$p \rightarrow$ <u>If the coefficient is in front of the squared binomial, find the coefficient's reciprocal (flip it as a fraction), and then divide by 4.</u></p> <p>Example:</p> $(y-2) = \frac{3}{2}(x+5)^2$ <p>(h, k) is the same, so $(h, k) = \boxed{(-5, 2)}$</p> <p>The number in front of the squared set is $\frac{3}{2}$. Flipped, it's $\frac{2}{3}$. p is that number divided by 4. So... $p = \frac{2}{3} \div 4 = \frac{2}{3} \cdot \frac{1}{4} = \frac{2}{12} = \boxed{\frac{1}{6}}$</p>

<p>1.</p> $\frac{(x+3)^2}{9} + \frac{(y-2)^2}{36} = 1$ <p>Conic: _____</p> <p>Circle the winner: X or Y (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>2.</p> $(x-3)^2 + (y+7)^2 = 49$ <p>Conic: _____</p> <p>Circle the winner: X or Y (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>3.</p> $24(y+2) = (x-4)^2$ <p>Conic: _____</p> <p>Circle the winner: X or Y (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>
<p>4.</p> $\frac{(x+1)^2}{4} - \frac{(y-7)^2}{16} = 1$ <p>Conic: _____</p> <p>Circle the winner: X or Y (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>5.</p> $(x+4)^2 + (y+6)^2 = 9$ <p>Conic: _____</p> <p>Circle the winner: X or Y (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>6.</p> $\frac{(x+2)^2}{49} - \frac{y^2}{9} = 1$ <p>Conic: _____</p> <p>Circle the winner: X or Y (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>
<p>7.</p> $\frac{(x+5)^2}{25} + \frac{(y+4)^2}{9} = 1$ <p>Conic: _____</p> <p>Circle the winner: X or Y (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>8.</p> $y-7 = \frac{1}{20}(x-4)^2$ <p>Conic: _____</p> <p>Circle the winner: X or Y (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>9.</p> $\frac{(x-6)^2}{4} + \frac{y^2}{64} = 1$ <p>Conic: _____</p> <p>Circle the winner: X or Y (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>

<p>10.</p> $-6(x - 8) = (y - 1)^2$ <p>Conic: _____</p> <p>Circle the winner: <i>X</i> or <i>Y</i> (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>11.</p> $(x - 5)^2 + (y - 8)^2 = 1$ <p>Conic: _____</p> <p>Circle the winner: <i>X</i> or <i>Y</i> (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>12.</p> $x + 4 = \frac{8}{5}(y + 5)^2$ <p>Conic: _____</p> <p>Circle the winner: <i>X</i> or <i>Y</i> (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>
<p>13.</p> $\frac{(y + 2)^2}{16} - \frac{(x - 6)^2}{49} = 1$ <p>Conic: _____</p> <p>Circle the winner: <i>X</i> or <i>Y</i> (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>14.</p> $x^2 + (y + 3)^2 = 36$ <p>Conic: _____</p> <p>Circle the winner: <i>X</i> or <i>Y</i> (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>15.</p> $x - 4 = -3y^2$ <p>Conic: _____</p> <p>Circle the winner: <i>X</i> or <i>Y</i> (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>
<p>16.</p> $\frac{(x + 2)^2}{25} + \frac{(y + 3)^2}{1} = 1$ <p>Conic: _____</p> <p>Circle the winner: <i>X</i> or <i>Y</i> (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>17.</p> $y - 5 = -\frac{1}{2}(x + 8)^2$ <p>Conic: _____</p> <p>Circle the winner: <i>X</i> or <i>Y</i> (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>	<p>18.</p> $\frac{(y + 3)^2}{36} - \frac{(x + 4)^2}{25} = 1$ <p>Conic: _____</p> <p>Circle the winner: <i>X</i> or <i>Y</i> (+ or -)</p> <p>$(h, k) =$ _____</p> <p>$a =$ _____, $b =$ _____; or</p> <p>$r =$ _____; or $p =$ _____</p>