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| Conic Section      | General Form                            |
|--------------------|---|
| Circle             | $x^2 + y^2 = r^2$                       |
| Parabola (smiling) | $x^2 - 2py = 0$                         |
| Ellipse            | $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ |
| Hyperbola          | $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ |

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Given the general quadratic:  $ax^2 + bx + cy^2 + dy + k = 0$

| <b>The Conics and the General Quadratic</b>            |                           |
|--|---------------------------|
| <b>Conditions on <math>a</math> and <math>c</math></b> | <b>then curve is a(n)</b> |
| If $a$ and $c$ have the same sign,                     | ellipse                   |
| If $a$ and $c$ have the same sign and $a = c$ ,        | circle                    |
| If $a$ and $c$ have the opposite signs,                | hyperbola                 |
| If $a$ and $c$ have the opposite signs and $a = c$ ,   | equilateral hyperbola     |
| If $a = 0$ or $c = 0$ (XOR).                           | parabola                  |

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