Parabolas in General Form:
$Ax^2 + By^2 + Cx + Dy + E = 0$
If either $A = 0$ or $B = 0$ then the equation defines a parabola ($x^2$ or $y^2$ is missing).
Isolate the variable that is not squared and use the completing the square method to convert the equation to that of a Parabola in **Standard Form**.
**Hint:** Solve for $y$ if there is no $y^2$ in the equation or solve for $x$ if there is no $x^2$ in the equation.
Ex 1) For the parabola $x^2 + 6x + 4y + 5 = 0$
find the vertex, axis of symmetry, focus, directrix, and then graph the parabola.

\[ 4y = -x^2 - 6x - 5 \]
\[ 4y + 5 = -x^2 - 6x \]
\[ 4y + 5 = -1(x^2 + 6x + 9) \]
\[ 4y + 5 = -1(x^2 + 6x + 9 - 9) \]
\[ 4y + 5 = -1(x^2 + 6x + 9) \]
\[ 4y + 5 = -1(x^2 + 6x + 9) + 4 \]
\[ 4y = -1(x + 3)^2 + 4 \]
\[ y = -\frac{1}{4}(x + 3)^2 + 1 \]
down wide vertex \((-3, 1)\)
axis of symmetry: \(x = -3\)
focus \((-3, 1 + \frac{1}{4(\frac{1}{4})})\)
\((-3, 1 + -1)\)
\((-3, 0)\)
directrix: \(y = 1 - \frac{1}{4(\frac{1}{4})}\)
\(y = 1 + 1\)

<table>
<thead>
<tr>
<th>(x)</th>
<th>(y)</th>
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<tbody>
<tr>
<td>(-2)</td>
<td>(\frac{3}{4})</td>
</tr>
<tr>
<td>(-1)</td>
<td>(0)</td>
</tr>
<tr>
<td>(0)</td>
<td>(-\frac{15}{4})</td>
</tr>
<tr>
<td>(1)</td>
<td>(-3)</td>
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<tr>
<td>(2)</td>
<td>(_)</td>
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\(y = 2\)
\(y = -\frac{1}{4}(x+3)^2 + 1\)
Ex 2) For the parabola $y^2 - 12x - 2y + 25 = 0$ find the vertex, axis of symmetry, focus, directrix, and graph the parabola.

\[12x = y^2 - 2y + 25\]
\[12x - 25 = y^2 - 2y\]
\[12x - 25 = y^2 - 2y + 1\]
\[12x - 24 = (y - 1)^2\]
\[\frac{12x}{12} = 1(y - 1)^2 + \frac{24}{12}\]
\[x = \frac{1}{12}(y - 1)^2 + 2\]
right wide vertex \((2, 1)\)
axis of symmetry: \(y = 1\)
focus \((2 + \frac{1}{4}, 1)\)
\((2 + \frac{1}{\frac{1}{2}}), 1)\)
\((5, 1)\)
directrix: \(x = 2 - \frac{1}{4\left(\frac{1}{2}\right)}\)
\(x = 2 - 3\)
\(x = -1\)

\[x = \frac{1}{12}(y - 1)^2 + 2\]