Write the three forms of a quadratic function and give what each tell you easily about the function.

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<th>Standard Form</th>
<th>Intercept Form</th>
<th>Vertex Form</th>
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<tr>
<td>( y = ax^2 + bx + c )</td>
<td>( y = a(x-p)(x-q) )</td>
<td>( y = a(x-h)^2 + k )</td>
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<tr>
<td>( y )-intercept</td>
<td>( x )-intercepts</td>
<td>( V(h, k) )</td>
</tr>
<tr>
<td>(0, c)</td>
<td>(p, 0) (q, 0)</td>
<td></td>
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</table>
Given the function $f(x) = (x - 6)(x + 4)$. Find the following key components and graph the function. Show your work or explain how to get the solution.

**Look at a value**

**Opening Direction**

$a = 1$

Opens up $a$ value is positive

**X-intercepts**

$x-6 = 0 \quad \quad x+4 = 0$

$x = 6 \quad \quad x = -4$

**Y-intercept**

$y = (x-6)(x+4)$

Let $x = 0$

$y = (0-6)(0+4)$

$(-6)(4)$

$-24$

**Line of symmetry and vertex**

Find $x$-coordinate of vertex halfway between intercepts

$\frac{6 + (-4)}{2} = \frac{2}{2} = 1 \quad \text{Vertex } (1, -25)$

$y = (1-6)(1+4)$

$(-5)(5)$

$-25$

**A.O.S.** $x = 1$

**Domain** $(-\infty, \infty)$

**Range** $[-25, \infty)$

[Graph of the function]
Given the function \( f(x) = -3(x + 1)^2 + 4 \). Find the following key components and graph the function. Show your work or explain how to get the solution.

\[ f(x) = a(x-h)^2 + k \]

**Opening Direction**
\( a = -3 \)

Open down because 
\( a \) is negative

**Y-intercept**
\[ y = -3(x+1)^2 + 4 \]
Let \( x = 0 \)

\[-3(0+1)^2 + 4\]
\[-3(1)^2 + 4\]
\[-3(1) + 4\]
\[1\]
\((0,1)\)

**Line of symmetry and vertex**
\[ V (-1,4) \] 
A.0.5 \( x = -1 \)

**Domain** \((-\infty, \infty)\)

**Range** \((-\infty, 4]\)
Rewrite the function \( f(x) = -3(x + 1)^2 + 4 \) in standard form. What new information does this form give you easily?

\[
\begin{align*}
f(x) &= -3(x + 1)^2 + 4 \\
&= -3(x+1)(x+1) + 4 \\
&= -3(x^2 + 2x + 1) + 4 \\
&= -3x^2 - 6x - 3 + 4 \\
&= -3x^2 - 6x + 1
\end{align*}
\]

Standard form
\[
y = ax^2 + bx + c
\]

\( y \)-intercepts
\[
(0, 1)
\]
Rewrite the function \( f(x) = (x - 6)(x + 4) \) in standard form. What new information does this form give you easily?

\[
\begin{align*}
f(x) &= (x - 6)(x + 4) \\
\therefore f(x) &= x^2 - 6x + 4x - 24 \\
\therefore f(x) &= x^2 - 2x - 24
\end{align*}
\]
Convert the following equation from vertex form to standard form.

\[ y = (x - 3)^2 - 5 \]
\[ y = (x - 2)^2 + 1 \]
\[ y = -2(x - 1)^2 + 2 \]
Convert the following equation from intercept form to standard form.

\[ y = (2x - 3)(x + 4) \quad y = 2(x - 2)(x + 6) \quad y = -5(x - 1)(x - 3) \]

\[ 2x^2 + 8x - 3x - 12 \]
\[ 2(x^2 + 4x - 2x - 12) \]
\[ 2(x^2 + 4x - 12) \]
\[ 2x^2 + 8x - 24 \]
\[ -5(x^2 - 3x - x + 5) \]
\[ -5(x^2 - 4x + 3) \]
\[ -5x^2 + 20x - 15 \]
Describe the transformation for each function from the function $f(x) = x^2$.

$p(x) = 2(x + 2)^2 - 3$
- Vertical stretch by factor of 2
- Shift left 2
- Down 3

$g(x) = \frac{1}{2}(x - 1)^2 + 2$
- Reflection over x-axis
- Vertical compression by a factor of $\frac{1}{2}$
- Right 1
- Up 2