Claim: The vertex of **F** can alternatively be given as $(h, k_o) \rightarrow (h, -ah^2)$.

Proof: Note that for **F**: ① The x intercepts are (0, 0) and $(-\frac{b}{a}, 0)$

② the axis of symmetry is halfway between these points, $h = -\frac{b}{2a}$.

Since the vertex must lie on the axis of symmetry,

③ the x coordinate of the vertex is $h = -\frac{b}{2a}$ and the y coordinate is $k_o = F(-\frac{b}{2a})$.

As shown below, the expression $F(-\frac{b}{2a})$ is equivalent to $-a\left(\frac{b}{2a}\right)^2$:

$F(x)$	=	$ax^2 + bx$	original function
$F(-\frac{b}{2a})$	=	$a(-\frac{b}{2a})^2 + b(-\frac{b}{2a})$	substitute $x = -\frac{b}{2a}$
	=	$\frac{b^2}{4a} - \frac{b^2}{2a}$	
	=	$\frac{b^2 - 2b^2}{4a}$	
	=	$\frac{-b^2}{4a}$	simplify
		$\frac{-b^2}{4a} \cdot \frac{a}{a}$	multiply by $\frac{a}{a}$
	=	$-a\left(\frac{b}{2a}\right)^2$	result

From $h = -\frac{b}{2a}$ we have $-h = \frac{b}{2a}$ and it follows that

$F(-\frac{b}{2a})$	=	$-a(-h)^2$	substitute $-h = \frac{b}{2a}$
	=	$-ah^2$	$(-h)^2 = h^2$

This verifies $k_o = -ah^2$. The vertex of **F** is $(h, k_o) \rightarrow (h, -ah^2)$ as claimed. ◆