h(x) FUNction Summary TEMPLATE

$$\begin{bmatrix} \text{MATH by Wilson} \\ \text{Your Personal Mathematics Trainer} \\ \text{MathByWilson.com} \end{bmatrix}$$

FUNCTION: $h(x) = 4(x+1)^2 - 6 = 4x^2 + 8x - 2$

Complete the Square:

$$4x^2 + 8x - 2 = 4\left(x^2 + 2x + [\ ]\right) - 2 + [\ ]$$
$$= 4\left(x^2 + 2x + [1]\right) - 2 + [-4]$$
$$= 4(x+1)^2 - 6$$

$f(x) = x^2$

$A = 4$: Vertical Stretch

$B = 1$: No effect

$C = 1$: Horizontal Translation ; 1 unit to the left

$D = -6$: Vertical Translation ; 6 units downward

Note: Since $h(x)$ is "nice", we can find the graph of $h(x)$ *before* finding **all** of the FUNction Summary Properties. However, we will still put its graph in Step #10 below. Appropriate calculations are shown at the bottom of the template.

1) **DOMAIN:**

   Dom $h = \mathbb{R}_x$

2) **INTERCEPT POINT(S):**

   y-intercept point: $(0, -2)$

   $x-$ intercept points: $\left(-1 - \dfrac{\sqrt{6}}{2}, 0\right) \approx (-2.2247, 0)$; $\left(-1 + \dfrac{\sqrt{6}}{2}, 0\right) \approx (0.2247, 0)$

3) CONTINUITY AND RELATED TOPICS:

CONT h $= \mathbb{R}_x$

DISCONT h $= \varnothing$; Empty Set

Hole h : N/A

Fin _ Jp h : N/A

V _ Asy h : N/A

Advanced : N/A

POS h $= (-\infty, -2.22)_x \cup (0.22, +\infty)_x$

NEG h $= (-2.22, 0.22)_x$

4) BEHAVIOUR AT (TOWARD) INFINITY:

$\underset{x \to -\infty}{\textbf{LIM}} \textbf{h}(\textbf{x}) = +\infty$; as the x-values decrease without bound,

the cooresponding y-values increase without bound

$\underset{x \to +\infty}{\textbf{LIM}} \textbf{h}(\textbf{x}) = +\infty$; as the x-values increase without bound,

the cooresponding y-values increase without bound

H _ Asy h : N/A

5) SYMMETRY (y -axis *or* $(0,0)$**):**

Even h : No

Odd h : No

Other: $\textbf{x} = -1$

6) INCREASING AND DECREASING:

INC h $= [-1, +\infty)_x$

DEC h $= (-\infty, -1]$

7) RELATIVE MAXIMUM AND/OR MINIMUM POINT(S):

R _ MAX _ Pt h : N/A

R _ MIN _ Pt h : $(-1, -6)$

8) CONCAVITY:

CU h $= (-\infty, +\infty)_x$

CD h $=$ N/A

9) INFLECTION POINT(S):

INF _ Pt h : N/A

10) GRAPH:

GRAPH h :

Quadratic FUNctions
$h(x) = 4(x + 1)^2 - 6 = 4x^2 + 8x - 2$ (a = 4
A = 4 ; B = 1 ; C = 1 ; D = -6
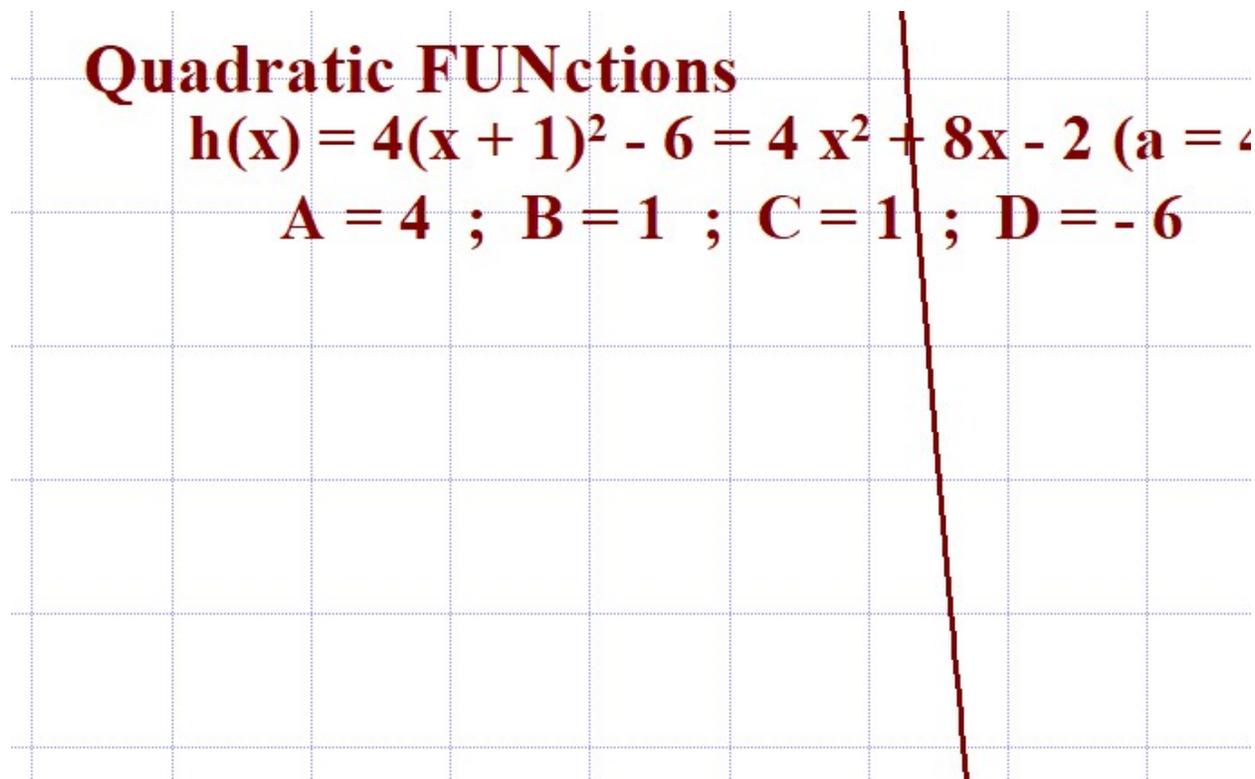
11) ABSOLUTE MAXIMUM AND/OR MINIMUM POINT(S):

A _ MAX _ Pt h : N/A

A _ MIN _ Pt h : $(-1,-6)$

12) RANGE:

RANGE h $= \left[-6,+\infty\right)_y$

Calculations:

1. Intercepts:
   a. y-intercept: $\mathbf{h}(0) = -2 \Rightarrow (0,-2)$
   b. x-intercepts: $\mathbf{h(x)} \overset{\text{SET}}{=} 0 \Rightarrow$

   $$4(\mathbf{x}+1)^2 - 6 = 0 \Rightarrow (\mathbf{x}+1)^2 = \frac{6}{4} \Rightarrow \mathbf{x}+1 = \pm\sqrt{\frac{6}{4}}$$

   $$\Rightarrow \mathbf{x} = -1 \pm \frac{\sqrt{6}}{2} \Rightarrow \left(-1-\frac{\sqrt{6}}{2},0\right); \left(-1+\frac{\sqrt{6}}{2},0\right)$$

   $$\Rightarrow \approx (-2.22,0); (0.22)$$

2. Continuity:

$$\overbrace{\rule{5cm}{0pt}}^{+} -2.22 \overbrace{\rule{4cm}{0pt}}^{-} 0.22 \overbrace{\rule{4cm}{0pt}}^{+}$$