

# **h(x) FUNCTION Summary TEMPLATE**

## **Absolute Value FUNCTION**

$$\left[ \begin{array}{c} \text{MATH by Wilson} \\ \text{Your Personal Mathematics Trainer} \\ \text{MathByWilson.com} \end{array} \right]$$

**FUNCTION:**  $h(x) = -3|2x - 5| + 4$

$$f(x) = |x|$$

**A** = -3 : Vertical Stretch ; Reflection in x-axis

**B** = 2 : Horizontal Contraction

**C** = -5 : Horizontal Translation ; 5/2 units to the right

**D** = 4 : Vertical Translation ; 4 units upward

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** =  $\mathbb{R}_x$  ; allowable x values

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

y-intercept point:  $(0, -11)$  ; graph intersects the y-axis

x – intercept points:  $\left(\frac{11}{6}, 0\right)$ ;  $\left(\frac{19}{6}, 0\right)$  ; graph intersect the x-axis twice

### **3) CONTINUITY AND RELATED TOPICS:**

**CONT h** =  $\mathbb{R}_x$  ; NO breaks in the graph

**DISCONT h** =  $\emptyset$  ; Empty Set

**Hole h** : N/A ; NO holes in the graph

**Fin \_ Jp h** : N/A ; NO finite Jumps (stair step behavior) in graph

**V \_ Asy h** : N/A ; NO vertical asymptotes

**Advanced** : N/A

$$\text{POS } h = \left( \frac{11}{6}, \frac{19}{6} \right)_x ; h(x) > 0$$

$$\text{NEG } h = \left( -\infty, \frac{11}{6} \right)_x \cup \left( \frac{19}{6}, +\infty \right)_x ; h(x) > 0$$

**4) BEHAVIOUR AT (TOWARD) INFINITY:**

$\lim_{x \rightarrow -\infty} h(x) = -\infty$  ; as the x-values decrease without bound,  
the corresponding y-values decrease without bound

$\lim_{x \rightarrow +\infty} h(x) = -\infty$  ; as the x-values increase without bound,  
the corresponding y-values decrease without bound

**H\_Asy h** : N/A ; NO horizontal asymptotes

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

**Even h** : No ; graph NOT symmetric with respect to y-axis

**Odd h** : No ; graph NOT symmetric with respect to (0,0)

**Other** :  $x = \frac{5}{2}$  ; graph symmetric with respect to vertical line  $x = 5/2$

**6) INCREASING AND DECREASING:**

**INC h** =  $\left( -\infty, \frac{5}{2} \right]_x$  ; graph going up on this interval

**DEC h** =  $\left[ \frac{5}{2}, +\infty \right)$  ; Graph going down on this interval

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

**R\_MAX\_Pt h** :  $\left( \frac{5}{2}, 4 \right)$  ; high point on the graph

**R\_MIN\_Pt h** : N/A ; NO low point on the graph

**... OMIT FOR NOW ...**  
except range if known

**8) CONCAVITY:**

CU  $h = \text{N/A}$  ; graph NEVER smiling

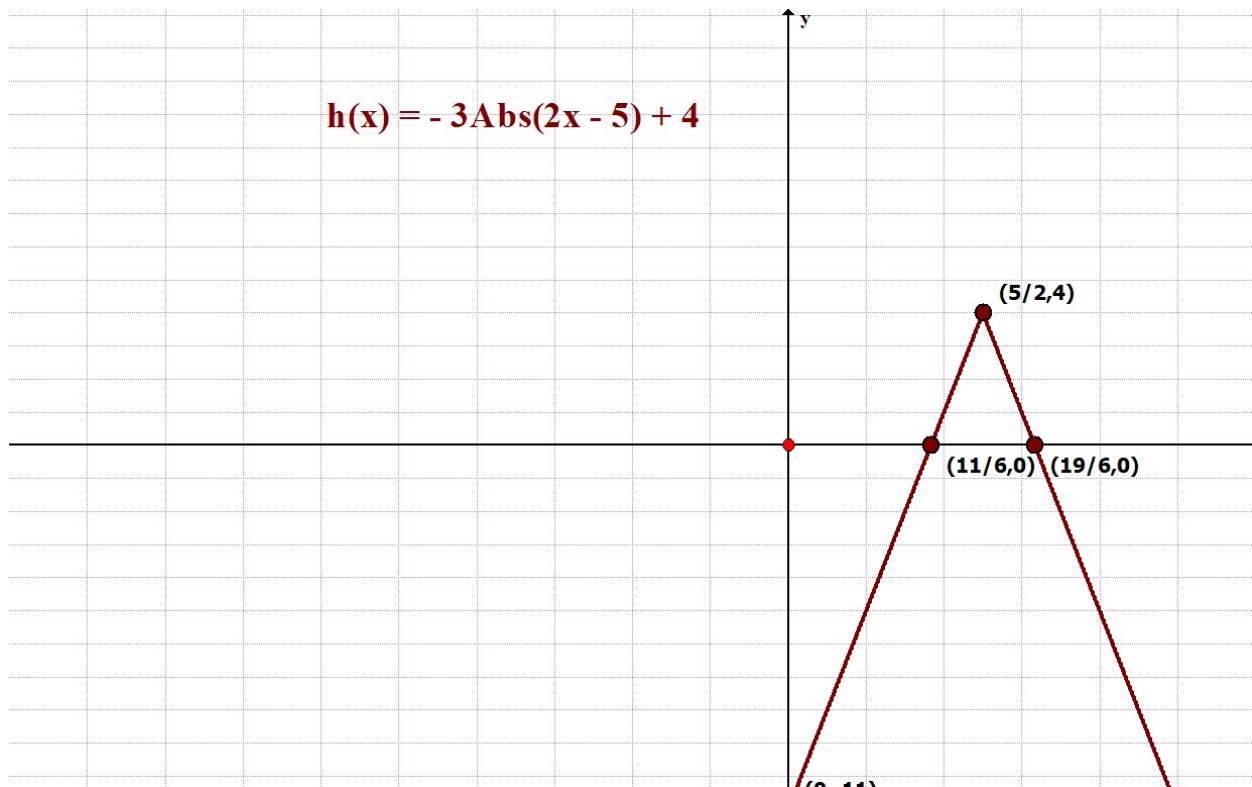
CD  $h = (-\infty, +\infty)_x$  ; graph ALWAYS smiling

**9) INFLECTION POINT(S):**

INF\_Pt  $h$  : N/A ; NO change from smiling to frowning or vice versa

**10) GRAPH:**

GRAPH  $h$  :



**11) ABSOLUTE MAXIMUM AND/OR MINIMUM POINT(S):**

A\_MAX\_Pt  $h$  :  $(\frac{5}{2}, 4)$  ; highest point on graph

A\_MIN\_Pt  $h$  : N/A ; NO lowest point on graph

12) RANGE:

$$\text{RANGE } h = (-\infty, 4]_y$$

**Calculations:**

1. Intercepts:

a. y-intercept:  $h(0) = -3|0-5|+4 = -11 \Rightarrow (0, -11)$

b. x-intercepts:

$$h(x) \stackrel{\text{SET}}{=} 0 \Rightarrow -3|2x-5|+4=0 \Rightarrow |2x-5| = \frac{4}{3} \Rightarrow$$

$$2x-5 = -\frac{4}{3} \quad \Bigg| \quad 2x-5 = \frac{4}{3}$$

$$2x = \frac{11}{3} \quad \Bigg| \quad 2x = \frac{19}{3}$$

$$x = \frac{11}{6} \quad \Bigg| \quad x = \frac{19}{6}$$

$$\left(\frac{11}{6}, 0\right) \quad \Bigg| \quad \left(\frac{19}{6}, 0\right)$$

2. Continuity:

$$\overbrace{\hspace{1.5cm}}^- \quad 11/6 + \overbrace{\hspace{1.5cm}}^+ \quad 19/6 \quad \overbrace{\hspace{1.5cm}}^-$$