A box with an open top is formed by cutting squares out of the corners of a rectangular piece of cardboard and then folding up the sides. Before cutting, the width of the cardboard is 4 inches and the length is 6 inches. If \( x \) represents the length of the side of the square cut from each corner of the rectangle, what size square must be cut if the volume of the box is to be 8 cubic inches?

**ANSWER:**

The volume of the resulting box is

\[
V(x) = x(4 - 2x)(6 - 2x) = 4x^3 - 20x^2 + 24x
\]

Since we want the volume to be 8 cubic inches, then we set \( V(x) \) equal to 8 and solve for \( x \).

\[
4x^3 - 20x^2 + 24x = 8 \\
4x^3 - 20x^2 + 24x - 8 = 0 \\
4(x^3 - 5x^2 + 6x - 2) = 0 \\
x^3 - 5x^2 + 6x - 2 = 0
\]

Then we use the techniques from this section to find the roots.

**HINT:** When you find your roots, make sure to check which ones work within the physical constraints of the problem!