Simplify the expression

\[ I(x) = \sqrt{9 + x^2 - 6x} + \sqrt{x^2 - 4x + 4}. \]

**Solution:**

\[
I(x) = \sqrt{9 + x^2 - 6x} + \sqrt{x^2 - 4x + 4} \\
= \sqrt{(x - 3)^2} + \sqrt{(x - 2)^2} \\
= |x - 3| + |x - 2|
\]

We now consider the following three cases:

**Case 1:** \( x \in (-\infty, 2] \)

In this case \( x - 3 < 0 \) and \( x - 2 < 0 \) and therefore \( |x - 3| = 3 - x \) and \( |x - 2| = 2 - x \).

Therefore

\[ I(x) = 3 - x + 2 - x = 5 - 2x. \]

**Case 2:** \( x \in (2, 3] \)

In this case \( x - 3 < 0 \) and \( x - 2 > 0 \) and therefore \( |x - 3| = 3 - x \) and \( |x - 2| = x - 2 \).

Therefore

\[ I(x) = 3 - x + x - 2 = 1. \]

**Case 3:** \( x \in (3, \infty) \)

In this case \( x - 3 > 0 \) and \( x - 2 > 0 \) and therefore \( |x - 3| = x - 3 \) and \( |x - 2| = x - 2 \).

Therefore

\[ I(x) = x - 3 + x - 2 = 2x - 5. \]

Summarizing Cases 1, 2, and 3, we therefore have that

\[ I(x) = \begin{cases} 
5 - 2x & \text{for } x \in (-\infty, 2] \\
1 & \text{for } x \in (2, 3] \\
2x - 5 & \text{for } x \in (3, \infty) 
\end{cases} \]