Exercise #80 (p.209)

Solve (the linear inequality): \(5(x + 3) + 9 \leq 3(x - 2) + 6\)

Treat the inequality similar to an equation, in the intention to isolate the variable “\(x\)” one can simplify both the left- and right-hand sides of the equation by utilizing the distributive property as follows...

\[
5x + 5 \cdot 3 + 9 \leq 3x - 3 \cdot 2 + 6
\]

\(i.e.,\)

\[
5x + 15 + 9 \leq 3x - 6 + 6
\]

Next simplify both sides, collecting like terms (doing the arithmetic), which yields

\[
5x + 24 \leq 3x
\]

In order to isolate “\(x\)” we need one instance of it (not two), so let’s subtract “5x” from both sides as shown

\[
\begin{align*}
5x + 24 & \leq 3x \\
-5x & \quad -5x
\end{align*}
\]

and hence we obtain

\[
24 \leq -2x
\]

Now we wish to remove the factor of “-2” and dividing both sides by it will do the trick, however don’t that forget we’re dividing by a negative # (and thus the inequality sign is reversed)

\[
\begin{align*}
\frac{24}{-2} & \geq \frac{-2x}{-2} \\
-12 & \geq x
\end{align*}
\]

Answer: \(x \leq -12\)