Given that \[
\begin{vmatrix}
 a & b \\
 c & d
\end{vmatrix} = 1,
\]
for what \(x\) (in terms of \(a, b, c\) and \(d\)) do we have that:
\[
\begin{vmatrix}
 5c + 10a & 10a \\
 d + 2b + x & 2b
\end{vmatrix} = 30
\]
You must use the given information and reduce the solution for \(x\) as much as possible.

Solution: We use column and/or row operations to reduce the determinant:
\[
\begin{vmatrix}
 5c + 10a & 10a \\
 d + 2b + x & 2b
\end{vmatrix} = 5
\begin{vmatrix}
 c + 2a & 2a \\
 d + 2b + x & 2b
\end{vmatrix}
= 5
\begin{vmatrix}
 c & 2a \\
 d + x & 2b
\end{vmatrix}
= 10
\begin{vmatrix}
 c & a \\
 d + x & b
\end{vmatrix}
= 10(bc - ad - ax)
\]
But we know that \(ad - bc = 1\) so then \(bc - ad = -1\). Plugging this in above and setting our determinant equal to 30 yields:
\[
10(-1 - ax) = 30
\]
\[
-1 - ax = 3
\]
\[
ax = -4
\]
\[
x = \frac{-4}{a}
\]