(8) $\left[\begin{array}{ccc|ccc} 1 & 2 & 3 & 1 & 0 & 0 \\ -1 & 1 & 0 & 0 & 1 & 0 \\ 0 & 3 & 3 & 0 & 0 & 1 \end{array}\right]$ add the 1st row to the second $\sim$

$\sim \left[\begin{array}{ccc|ccc} 1 & 2 & 3 & 1 & 0 & 0 \\ 0 & 3 & 3 & 1 & 1 & 0 \\ 0 & 3 & 3 & 0 & 0 & 1 \end{array}\right] \sim$ subtract the 2nd row from the first and divide the 2nd by 3

$\sim \left[\begin{array}{ccc|ccc} 1 & 2 & 3 & 1 & 0 & 0 \\ 0 & 1 & 1 & Y_3 & Y_3 & 0 \\ 0 & 0 & 0 & -1 & -1 & 1 \end{array}\right]$

↳ We see that we can't get $\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & & & \\ 0 & 1 & 0 & & & \\ 0 & 0 & 1 & & & \end{array}\right]$ doing further row operations, since the last row is zero

$\Rightarrow$ the matrix $\begin{pmatrix} 1 & 2 & 3 \\ -1 & 1 & 0 \\ 0 & 3 & 3 \end{pmatrix}$ is <u>not</u> invertible