1. Suppose $A$, $B$ and $C$ are $3 \times 3$ matrices for which $|A| = 3$, $|B| = 5$ and $|2AB^{-1}C| = 6$. Find $|C|$.

\[
|2AB^{-1}C| = 6 \\
2^3|AB^{-1}C| = 6 \\
8|A||B^{-1}||C| = 6 \\
8|A||C| = 6 \\
\frac{8 \cdot 3 \cdot |C|}{5} = 6 \\
|C| = \frac{5 \cdot 6}{24} = \frac{5}{4}
\]

Answer: $|C| = \frac{5}{4}$.

2. Find the value(s) of $k$ for which the matrix

\[
\begin{bmatrix}
1 & 0 & 5 \\
2 & 2 & 0 \\
6 & 5 & k
\end{bmatrix}
\]

is not invertible.

Let’s calculate the determinant by expanding along the third column:

\[
\begin{vmatrix}
1 & 0 & 5 \\
2 & 2 & 0 \\
6 & 5 & k
\end{vmatrix}
= 5 \begin{vmatrix} 2 & 2 \\ 6 & 5 \end{vmatrix} + k \begin{vmatrix} 1 & 0 \\ 2 & 2 \end{vmatrix}
= 5 \cdot (-2) + 2k = -10 + 2k
\]

Thus the determinant is $2k - 10$, and this can only be zero if $k = 5$.

Answer: the matrix is not invertible if $k = 5$. If $k$ has any other value, the matrix is invertible.