$$= \begin{pmatrix}
\begin{aligned}
& B_{21}B_{32}x_1y_2 + B_{21}B_{33}x_1y_3 + B_{22}B_{31}x_2y_1 + B_{22}B_{33}x_2y_3 + B_{23}B_{31}x_3y_1 + B_{23}B_{32}x_3y_2 \\
& - B_{31}B_{22}x_1y_2 - B_{31}B_{23}x_1y_3 - B_{32}B_{21}x_2y_1 - B_{32}B_{23}x_2y_3 - B_{33}B_{21}x_3y_1 - B_{33}B_{22}x_3y_2
\end{aligned} \\[2em]
\begin{aligned}
& B_{31}B_{12}x_1y_2 + B_{31}B_{13}x_1y_3 + B_{32}B_{11}x_2y_1 + B_{32}x_2y_3 + B_{33}B_{11}x_3y_1 + B_{33}B_{12}x_3y_2 \\
& - B_{11}B_{32}x_1y_2 - B_{11}B_{33}x_1y_3 - B_{12}B_{31}x_2y_1 - B_{12}x_2y_3 - B_{13}B_{31}x_3y_1 - B_{13}B_{32}x_3y_2
\end{aligned} \\[2em]
\begin{aligned}
& B_{11}B_{22}x_1y_2 + B_{11}B_{23}x_1y_3 + B_{12}B_{21}x_2y_1 + B_{12}B_{23}x_2y_3 + B_{13}B_{21}x_3y_1 + B_{13}B_{22}x_3y_2 \\
& - B_{21}B_{12}x_1y_2 - B_{21}B_{13}x_1y_3 - B_{22}B_{11}x_2y_1 - B_{22}B_{13}x_2y_3 - B_{23}B_{11}x_3y_1 - B_{23}B_{12}x_2y_2
\end{aligned}
\end{pmatrix}$$

$$= \begin{pmatrix}
\begin{aligned}
& (B_{21}B_{32}-B_{31}B_{22})x_1y_2 + (B_{21}B_{33}-B_{31}B_{23})x_1y_3 + (B_{22}B_{31}-B_{32}B_{21})x_2y_1 \\
& + (B_{22}B_{33}-B_{32}B_{23})x_2y_3 + (B_{23}B_{31}-B_{33}B_{21})x_3y_1 + (B_{23}B_{32}-B_{33}B_{22})x_3y_2
\end{aligned} \\[2em]
\begin{aligned}
& (B_{31}B_{12}-B_{11}B_{32})x_1y_2 + (B_{31}B_{13}-B_{11}B_{33})x_1y_3 + (B_{32}B_{11}-B_{12}B_{31})x_2y_1 \\
& + (B_{32}B_{13}-B_{12}B_{33})x_2y_3 + (B_{33}B_{11}-B_{13}B_{31})x_3y_1 + (B_{13}B_{22}-B_{23}B_{12})x_3y_2
\end{aligned} \\[2em]
\begin{aligned}
& (B_{11}B_{22}-B_{21}B_{12})x_1y_2 + (B_{11}B_{23}-B_{21}B_{13})x_1y_3 + (B_{12}B_{21}-B_{22}B_{11})x_2y_1 \\
& + (B_{12}B_{23}-B_{22}B_{13})x_2y_3 + (B_{13}B_{21}-B_{23}B_{11})x_3y_1 + (B_{13}B_{22}-B_{23}B_{12})x_3y_2
\end{aligned}
\end{pmatrix}$$

$$= \begin{pmatrix}
(B_{21}B_{32}-B_{31}B_{22})(x_1y_2-x_2y_1) + (B_{21}B_{33}-B_{31}B_{23})(x_1y_3-x_3y_1) + (B_{22}B_{33}-B_{32}B_{23})(x_2y_3-x_3y_2) \\[1em]
(B_{31}B_{12}-B_{11}B_{32})(x_1y_2-x_2y_1) + (B_{31}B_{13}-B_{11}B_{33})(x_1y_3-x_3y_1) + (B_{32}B_{13}-B_{12}B_{33})(x_2y_3-x_3y_2) \\[1em]
(B_{11}B_{22}-B_{21}B_{12})(x_1y_2-x_2y_1) + (B_{11}B_{23}-B_{21}B_{13})(x_1y_3-x_3y_1) + (B_{12}B_{23}-B_{22}B_{13})(x_2y_3-x_3y_2)
\end{pmatrix}$$

$$= \left\{ \begin{pmatrix}
\begin{vmatrix} B_{22} & B_{23} \\ B_{32} & B_{33} \end{vmatrix} & -\begin{vmatrix} B_{21} & B_{23} \\ B_{31} & B_{33} \end{vmatrix} & \begin{vmatrix} B_{21} & B_{22} \\ B_{31} & B_{32} \end{vmatrix} \\[1.5em]
-\begin{vmatrix} B_{12} & B_{13} \\ B_{32} & B_{33} \end{vmatrix} & \begin{vmatrix} B_{11} & B_{13} \\ B_{31} & B_{33} \end{vmatrix} & -\begin{vmatrix} B_{11} & B_{12} \\ B_{31} & B_{32} \end{vmatrix} \\[1.5em]
\begin{vmatrix} B_{12} & B_{13} \\ B_{22} & B_{23} \end{vmatrix} & -\begin{vmatrix} B_{11} & B_{13} \\ B_{21} & B_{23} \end{vmatrix} & \begin{vmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{vmatrix}
\end{pmatrix} \right\}
\begin{pmatrix}
x_2y_3 - x_3y_2 \\[1em]
x_3y_1 - x_1y_3 \\[1em]
x_1y_2 - x_2y_1
\end{pmatrix}$$