Exercise3.5.3

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Exercise. *Let ω and ν be the following 1-forms:*

$$\omega(\langle dx, dy \rangle) = 2dx - 3dy.$$

$$\nu(\langle dx, dy \rangle) = dx + dy.$$

Find a constant c such that $\omega \wedge \nu = c\,dx \wedge dy$.

Solve. For any $V_1 = \langle a_1, b_1 \rangle$, $V_2 = \langle a_2, b_2 \rangle$.

$$dx \wedge dy(V_1, V_2) = \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = a_1 b_2 - a_2 b_1.$$

$$\omega \wedge \nu(V_1, V_2) = \begin{vmatrix} \omega(V_1) & \nu(V_1) \\ \omega(V_2) & \nu(V_2) \end{vmatrix} = 5(a_1 b_2 - a_2 b_1).$$

So $c = 5$. $\qquad\square$

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