- 4 x 4 matrix
- $\det(A) = -4$

① $\underline{\det(A_1) \text{ where } A_1 \text{ obtained}}$
   $\underline{\text{by } 12R_4 + R_1 \longrightarrow R_1:}$

- Adding a multiple of one row to another does NOT change the determinant

- So

$$\det(A_1) = \det(A) = -4$$
$$\boxed{\det(A_1) = -4}$$

② $\underline{\det(A_2) \text{ where } A_2 \text{ is obtained}}$
   $\underline{\text{by } R_1 \longleftrightarrow R_4:}$

- Swapping two rows multiplies the determinant by -1

- So

$$\det(A_2) = -\det(A) = -(-4) = 4$$
$$\boxed{\det(A_2) = 4}$$

③ $\underline{\det(A_3) \text{ where } A_3 \text{ is obtained by}}$
   $\underline{8R_2 \longrightarrow R_2:}$

- Multiply a single row by a scalar "K" multiplies the determinant by "K".

- So

$$\det(A_3) = 8 \times \det(A) = 8 \times (-4) = -32$$
$$\boxed{\det(A_3) = -32}$$