Step-1

Let T be a matrix such that $T \times e_1 = v_1,\ T \times e_2 = v_2,\ T \times e_3 = v_3$

Then we follow that T is a $n \times n$ matrix which transforms each e_i to v_i , $1 \le i \le 3$ and e_i is the i^{th} , $n \times 1$ standard basis vector.

T is the required transformation matrix.

Step-2

Observe that T is applied on three standard basis vectors and resulted in three other vectors v_1, v_2, v_3

If these vectors are linearly independent and span a vector space, then it is obviously R^3 and so, forms a square matrix T and has the determinant not zero.

Thus T is invertible.