24. (Statement of the problem.)

Proof. a) Since A is row equivalent to B, by the definition, there are elementary matrices $E_1, \cdots, E_k$ such that

$$A = E_k \cdots E_1 B. \tag{1}$$

Since B is row equivalent to C, by the definition, there are elementary matrices $F_1, \cdots, F_j$ (*Note: Use different notation!*) such that

$$B = F_j \cdots F_1 C. \tag{2}$$

Substitute (2) into (1) we get

$$A = E_k \cdots E_1 F_j \cdots F_1 C.$$

Since $E_1, \cdots, E_k, F_1, \cdots, F_j$ are elementary matrices, by the definition, A is row equivalent to C.

b) Suppose both A and B are nonsinngular $n \times n$ matrices.
By Theorem 1.4.2, A is row equivalent to I and B is row equivalent to I.
Since B is row equivalent to I, by Problem 23, I is row equivalent to B.
So we have that A is row equivalent to I and I is row equivalent to B.
By Part (a), we get that A is row equivalent to B. $\square$

A short version of Part (b) is like the following:
Suppose both A and B are nonsinngular $n \times n$ matrices.
By Theorem 1.4.2, A is row equivalent to I and B is row equivalent to I.
By Problem 23, I is row equivalent to B.
By Part (a), A is row equivalent to B. $\square$