

Name (Last, First): _____

Student ID: _____

1. Assume the following assertions are true:

There are courses at Berkeley.

In every Berkeley course, there is a student who understands everything.

Circle each of the following assertions which must also then be true:

a. *There is a Berkeley course in which all students understand something.*

b. *There is a Berkeley course in which all students understand nothing.*

c. *There is no Berkeley course in which each student understands nothing.*

d. *There is no Berkeley course in which each student does not understand something.*

e. *There is a Berkeley course in which there is a student who understands everything.*

c, d, and e must be true.

2. For what numbers a, b, c is the following matrix in row echelon form (REF) or reduced row echelon form (RREF)?

$$\begin{bmatrix} 0 & a & 1 & b & 0 \\ 0 & 0 & 0 & c & 0 \\ 0 & 0 & 0 & 0 & a \end{bmatrix}$$

REF: $a = 0$ and any b, c ; or $a, c \neq 0$ and any b .

RREF: $a, c = 1$ and $b = 0$; or $a = 0, b = 0, c = 1$; or $a, c = 0$ and any b .