## Math 1553 J1-J4 Quiz : Sections 1.1-1.2

Solutions

The quiz has a total of 10 points and you have 10 minutes. Read carefully.

1. [2 points each] Give an example of ...
(1) $\ldots$ a $4 \times 5$ matrix in row echelon form that it is not in reduced row echelon form (and justify your answer).
(2) ... an augmented matrix in reduced row echelon form that corresponds to a system of 3 equations with 4 variables.

## Solution.

(1) For an echelon form not to be reduced row echelon form either: there is a pivot that is not a coefficient 1 or there are some entries above a pivot that are not zeros. 1 point for giving a valid matrix and 1 point for stating which of the entries violate the definition of reduced echelon form.
(2) Such augmented matrix will contain 3 rows, one for each equation, and 5 columns, one for each variable and the last one for the coefficients. 1 point for giving a $3 \times 5$ matrix and 1 point for it having a reduced row echelon form.
2. [3 points each] For the following augmented matrices determine how many free variables contains the corresponding system of equations, justify your answer.
(Hint: the shape of the echelon form suffices to have the answer.)
(1) $\left(\begin{array}{rr|r}1 & -3 & 1 \\ -2 & 8 & -2\end{array}\right)$
(2) $\left(\begin{array}{rrr|r}0 & 1 & -1 & 1 \\ 1 & 0 & 2 & 0 \\ 1 & 1 & 1 & 1\end{array}\right)$

## Solution.

(1) No free variables, the solution is $(x, y)=(1,0)$ and the corresponding reduced row echelon form is $\left(\begin{array}{ll|l}1 & 0 & 1 \\ 0 & 1 & 0\end{array}\right)$.
(2) One free variable, the parametrized solution is $(x, y, z)=(-2 z, 1+z, z)$ and the corresponding reduced echelon form is $\left(\begin{array}{rrr|r}1 & 0 & 2 & 0 \\ 0 & 1 & -1 & 1 \\ 0 & 0 & 0 & 0\end{array}\right)$
One point for stating the correct number of free variables. Two points for giving a correct sequence of row operations until having a row echelon form. Both the actual solution sets nor the reduced row echelon form is required this time.

