This document gives a guideline for producing top quality work in your upcoming homework assignments, quizzes, and exams. The check lists below communicate between the instructor and the students on what should be considered as excellent, good, acceptable, and poor work. To further illustrate the expectations, each category of work is followed by an example that answers the following question:

Let $A = \begin{bmatrix} 2 & 0 & 6 \\ -1 & 8 & 5 \\ 1 & -2 & 1 \end{bmatrix}$, let $\mathbf{b} = \begin{bmatrix} 10 \\ 3 \\ 7 \end{bmatrix}$. Denote the columns of A by $\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_3$, let $W = \text{span}\{\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_3\}$, and $S = \{\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_3\}$.

(a) How many vectors are in S? Is $\mathbf{b} \in S$? Why or why not?

(b) How many vectors are in W? Is $\mathbf{b} \in W$? Why or why not?

The writing that appears in gray shows an example of student work while the red ink illustrates the comments the student will receive when the problem is graded. Remember, grading is a VERY subjective process. If you are ever unsure whether your work constitutes as excellent, good, acceptable, or poor work, please ask your instructor to clarify that for you. In fact, you should develop a habit of asking the question "will my work here be considered as excellent?" as you mature into an excellent writer. Hopefully, this process of determining whether your work is excellent will become natural for you after a few mini writing and critiquing exchanges.

(EXCELLENT WORK) 10 POINTS (100%) – STUDENTS RECEIVE 10 POINTS OR 100% FOR THE SUBMITTED WORK IF ALL OF THE FOLLOWING ARE SATISFIED

- solutions or conclusions for all problems are correct;
- solution or conclusions are supported with correct logic and rationale;
- supporting work is free of errors of any kind such as computational, logical, and copying errors;
- work is shown clearly with legible writing and presented in an easy-to-follow fashion;
- computations are explained through uses of logical connectors such as *hence, if, then, implies, if and only if,* etc; and
- work is illustrated with appropriate uses of logical connectors such as equal sign and implications

An Example of Excellent Work:

(a) There are 3 vectors in the set S and $\underline{b}$ is NOT found in S, since $\underline{b} \neq \underline{a}_1$, $\underline{b} \neq \underline{a}_2$, and $\underline{b} \neq \underline{a}_3$. great supporting argument

(b) There are infinitely many vectors in W, since $W = \text{span}\{\underline{a}_1, \underline{a}_2, \underline{a}_3\}$
$= \{c_1\underline{a}_1 + c_2\underline{a}_2 + c_3\underline{a}_3 : c_1, c_2, c_3 \in \mathbb{R}\}$. [$\underline{b} \in W$ if and only if there is a solution to the system with augmented system $[A \mid b]$.] That is, if the system is consistent. But $[A \mid b] \overset{\text{rref}}{\sim} \left[\begin{array}{ccc|c} 1 & 0 & 3 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array}\right]$

excellent rationale for the work shown here

(The last row shows that the system is inconsistent, hence $\underline{b} \notin W$.)

Conclusion is written in complete sentence!

(GOOD WORK) 9 POINTS (90%) – STUDENTS RECEIVE 9 POINTS OR 90% FOR THE SUBMITTED WORK IF ANY OF THE FOLLOWING HAPPENS

- solutions or conclusions for all problems are correct, but one of the following happens
  - logical error in the supporting argument
  - copying error
  - omission of facts or statements in the supporting argument
- supporting work contains minor computational errors
- work is shown clearly with legible writing, but missing logical connectors such as equal signs.

An Example of Good Work:

(a) There are 3 vectors in the set S and $\underline{b}$ is Not found in S, since $\underline{b} \neq \underline{a}_1$, $\underline{b} \neq \underline{a}_2$, and $\underline{b} \neq \underline{a}_3$. great supporting argument

(b) There are infinitely many vectors in W.

why?

[$\underline{b} \in W$ if and only if there is a solution to the system with augmented system $[A \mid b]$. That is, if the system is consistent. But $[A \mid b] \sim \text{ref} \begin{bmatrix} 1 & 0 & 3 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

excellent rationale for the work shown here

(The last row shows that the system is inconsistent, hence $\underline{b} \notin W$.)

Conclusion is written in complete sentence!

(ACCEPTABLE WORK) 8 POINTS (80%) – STUDENTS RECEIVE 8 POINTS OR 80% FOR THE SUBMITTED WORK IF ANY TWO OF THE FOLLOWING HAPPENS

- solutions or conclusions for all problems are correct, but one or more of the following happens
  - logical error in the supporting argument
  - copying error
  - omission of facts or statements in the supporting argument
- supporting work contains minor computational errors
- work is shown clearly with legible writing, but missing logical connectors such as equal signs.

AN EXAMPLE OF ACCEPTABLE WORK:

(a) There are 3 vectors in the set S and $\underline{b}$ is Not in S since none of the elements in S is $\underline{b}$.] correct

(b) There are infinitely many vectors in W and $b \notin W$. why?

$$\begin{bmatrix} 2 & 0 & 6 & | & 10 \\ -1 & 8 & 5 & | & 3 \\ 1 & -2 & 1 & | & 7 \end{bmatrix} \xrightarrow{\text{rref}} \begin{bmatrix} 1 & 0 & 3 & | & 0 \\ 0 & 1 & 1 & | & 0 \\ 0 & 0 & 0 & | & 1 \end{bmatrix} \Rightarrow \text{inconsistent}$$

you seem to understand the concepts to solve this problem and show the correct work to support your argument; however, your conclusions are not supported with sufficient reasoning!

(POOR WORK) POINTS (70%) – STUDENTS RECEIVE 7 POINTS OR 70% FOR THE SUBMITTED WORK IF ONE OF THE FOLLOWING HAPPENS

- the work has three areas of deficiency from one or more of the following:
  - logical error in the supporting argument
  - copying error
  - omission of facts or statements in the supporting argument
- supporting work contains major computational errors and/or flawed logic
- work is not shown clearly and missing major supporting arguments

AN EXAMPLE OF POOR WORK:

(a) yes why? how many pts in S?

(b) infinitely many why?

$$\begin{bmatrix} 2 & 0 & 6 & 10 \\ -1 & 8 & 5 & 3 \\ 1 & -2 & 1 & 7 \end{bmatrix} \xrightarrow{R_3 \leftrightarrow R_1} \begin{bmatrix} 1 & -2 & 1 & 7 \\ -1 & 8 & 5 & 3 \\ 2 & 0 & 6 & 10 \end{bmatrix} \xrightarrow[2R_1 - R_2]{R_1 + R_2} \begin{bmatrix} 1 & -2 & 1 & 7 \\ 0 & 6 & 6 & 10 \\ 0 & 4 & 4 & -4 \end{bmatrix}$$

$$\xrightarrow{\frac{1}{4}R_3} \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 6 & 6 & 10 \\ 0 & 1 & 1 & -1 \end{array}\right] \xrightarrow{R_3 \leftrightarrow R_2} \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 1 & 1 & -1 \\ 0 & 6 & 6 & 10 \end{array}\right] \xrightarrow{-6R_2 + R_3} \left[\begin{array}{ccc|c} 1 & -2 & 1 & 7 \\ 0 & 1 & 1 & -1 \\ 0 & 0 & 0 & 16 \end{array}\right]$$

$\therefore b \notin W$

why?

What's the point of showing this work? and what's the conclusion of this work?

Comment: It's more important that you know Why you do the row reduction than actually do the row reduction. Showing work w/out explaining why you do it is treated as No Credit.