

Name:

Recitation Section:

**Math 2802 N1-N3 Quiz**

February 2nd, 2018

*The quiz has a total of 10 points and you have 15 minutes. Read carefully and clearly justify how you obtained your answers.*

1. [3 points] Find all the values of  $h$  for which the following vectors are linearly independent:

$$v_1 = \begin{pmatrix} 1 \\ -2 \\ 4 \end{pmatrix} \quad v_2 = \begin{pmatrix} 6 \\ -10 \\ 20 \end{pmatrix} \quad v_3 = \begin{pmatrix} -2 \\ 10 \\ h \end{pmatrix}$$

2. [3 points] Is the following transformation  $T : \mathbf{R}^n \rightarrow \mathbf{R}^n$  invertible? Justify your answer.

$$T \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 6x - 2y + z \\ -10x + 10y - 2z \\ 20x + 4z \end{pmatrix}$$

*Turn the page!*

3. [4 points]

For this problem, use the following row-reduction of  $A$ .

$$A = \begin{pmatrix} 1 & -3 & 4 & -1 & 5 \\ 3 & -9 & 7 & -2 & 9 \\ -2 & 6 & -3 & 1 & -4 \\ -1 & 3 & 6 & -1 & 7 \end{pmatrix} \sim \begin{pmatrix} 1 & -3 & 4 & -1 & 5 \\ 0 & 0 & -5 & 1 & -6 \\ 0 & 0 & 5 & -1 & 6 \\ 0 & 0 & 10 & -2 & 12 \end{pmatrix} \sim \begin{pmatrix} 1 & -3 & 4 & -1 & 5 \\ 0 & 0 & -5 & 1 & -6 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

Let  $A = LU$  where  $L$  is a lower triangular matrix and  $U$  is an echelon form.

- The dimensions of  $L$ : \_\_\_\_\_ rows  $\times$  \_\_\_\_\_ columns
- The dimensions of  $U$ : \_\_\_\_\_ rows  $\times$  \_\_\_\_\_ columns
- Construct the matrices  $L$  and  $U$ .