Math 330 Quiz 1 Version A

1. Let

$$A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & -3 \\ 1 & 3 & -1 \end{bmatrix}, \qquad x = \begin{bmatrix} 2 \\ 1 \\ -9 \end{bmatrix} \quad \text{and} \quad b = \begin{bmatrix} 3 \\ 0 \\ 1 \end{bmatrix}.$$

(i) Find $\frac{2}{3}b$

(ii) Find $x + b$

(iii) Find $x \cdot b$

(iv) Find Ax

Math 330 Quiz 1 Version A

2. Give a concrete example of a vector v such that $v \in \mathbf{R}^4$.

3. Give a concrete example of a matrix A such that $A \in \mathbf{R}^{3\times 5}$.

4. Let u and v be vectors in $\mathbf{R}^2$ such that $\|u\| = 1$ and $\|v\| = 1$. Use the angle addition and subtraction formulas from trigonometry to explain why $v \cdot u = \cos\theta$ where θ is the angle between the vectors u and v.

Math 330 Quiz 1 Version A

5. Apply the elimination algorithm to the matrix

$$\begin{bmatrix} 2 & 4 & 2 & -4 & 11 & 3 \\ 2 & 4 & 2 & -6 & 12 & 7 \\ -2 & -4 & -2 & 5 & -11 & -1 \end{bmatrix}$$

Indicate each row operation in the form $r_i \leftarrow r_i + \alpha r_j$ where $i \neq j$ and the write matrix after each operation.

6. Let $A \in \mathbf{R}^{4\times 12}$.

(i) Find P such that the row operation $r_1 \leftrightarrow r_2$ on A is given by PA.

(ii) Find E such that the row operation $r_2 \leftarrow r_2 + \frac{1}{2}r_1$ on AP is given by $E(PA)$.

(iii) Compute the matrix EP.

(iv) Find D such that the row operation $r_3 \leftarrow 5r_3$ on A is given by DA.