

TRENT UNIVERSITY
MATH 1350H Test
3 June, 2014
Time: 60 minutes

Name: _____

STUDENT NUMBER: _____

Question	Mark
1	_____
2	_____
3	_____
4	_____
Bonus	_____
Total	_____ /40

Instructions

- *Show all your work.* Legibly, please!
- *If you have a question, ask it!*
- Use the back sides of the test sheets for rough work or extra space.
- You may use a calculator and an aid sheet.

1. Do any *two* (2) of **a–c**. [*10 = 2 × 5 each*]

Let $\mathbf{u} = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$, $\mathbf{v} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$, and $\mathbf{w} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$.

- a. Find the angle θ between \mathbf{u} and \mathbf{v} .
- b. Determine whether the lines given by $\mathbf{x} = \mathbf{u} + s\mathbf{v}$ and $\mathbf{x} = \mathbf{v} + t\mathbf{w}$ intersect or not.
- c. Find a non-zero vector perpendicular to both \mathbf{u} and \mathbf{v} .

2. Consider the following system of linear equations:

$$\begin{array}{rccccccc} & x & & & + & z & = & 4 \\ x & + & 2y & & & & = & 5 \\ 2x & + & 2y & + & kz & = & 12 \end{array}$$

a. Find all the solutions, if any, of this system for *one* (1) of $\left\{ \begin{array}{l} i. \quad k = 1 \\ ii. \quad k = 2 \end{array} \right\}$. [8]

b. Use your answer to **a** to determine whether $\begin{bmatrix} 4 \\ 5 \\ 12 \end{bmatrix} \in \text{Span} \left\{ \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 0 \\ 2 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ k \end{bmatrix} \right\}$. [2]

- 3.** Do any *two* (2) of **a–c**. [10 = 2 × 5 each]
- a.** Show that if the $n \times n$ matrix \mathbf{A} has an inverse and $c \neq 0$, then $c\mathbf{A}$ has an inverse.
 - b.** Find a vector-parametric equation for the plane $x - y + z = 3$.
 - c.** Sketch the lines $x + 2y = 2$ and $4x - 2y = 0$ and determine the angle between them.

4. Find the inverse matrix of $\begin{bmatrix} 2 & 4 & 6 \\ 1 & 3 & 9 \\ 0 & 1 & 2 \end{bmatrix}$. [10]

[Total = 40]

Bonus. A chip truck sells fries, cans of pop, and sandwiches. Any order of fries costs as much as any other, and similarly for cans of pop and sandwiches, respectively. *A* buys two orders of fries, two cans of pop, and a sandwich, which costs \$10.00; *B* buys two orders of fries, a can of pop, and a sandwich, which costs \$8.50; *C* buys an order of fries, two cans of pop, and a sandwich, which costs \$8.00; and *D* buys two orders of fries, two cans of pop, and two sandwiches. What does *D*'s purchase cost? [1]