MATH 1300(A02) QUIZ 3 March 04, 2016 B06

NAME SOLUTIONS ID Number

INSTRUCTIONS: Answer the following questions in the spaces provided below.

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[12] TOTAL

[2] **1.** Consider the equation $A\mathbf{x} = \mathbf{b}$, where $A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & 3 & 0 \\ 3 & 4 & 5 \end{bmatrix}$ and $\mathbf{b} = \begin{bmatrix} 0 \\ -2 \\ 3 \end{bmatrix}$.

CRAMER'S RULE

If $\det(A) = -5$, what is the value of x_2?

$$x_2 = \frac{1}{-5} \det \begin{bmatrix} 1 & 0 & 0 \\ 2 & -2 & 0 \\ 3 & 3 & 5 \end{bmatrix} = \frac{1}{-5}(1)(-2)(5) = 2.$$

[2] **2.** Let $A = \begin{bmatrix} 2 & b & -3 \\ 3 & c & 3 \\ d & 2 & e \end{bmatrix}$. Suppose that $\det(A) = -4$.

ADJOINT FORMULA

What is the entry in row 2, column 3, of A^{-1}?

$$(A^{-1})_{23} = \frac{1}{\det A}(-1)^{3+2} M_{32} = \frac{1}{(-4)}(-1)\det \begin{bmatrix} 2 & -3 \\ 3 & 3 \end{bmatrix} = \frac{1}{4}(6+9) = \frac{15}{4}$$

[8] **3.** Consider the vectors $\mathbf{u} = (3, -1, 2, -1)$, $\mathbf{v} = (2, -1, 0, 2)$, and $\mathbf{w} = (-3, -2, -1, 1)$.
Find:

(a) $\|\mathbf{v}\|$.

$$\|\underline{v}\| = \sqrt{2^2 + 1^2 + 0^2 + 2^2} = \sqrt{9} = 3.$$

(b) A unit vector in the direction of $\mathbf{v}$.

Divide by the norm of $\underline{v}$.

$$\frac{1}{3}(2, -1, 0, 2) = \left(\frac{2}{3}, \frac{-1}{3}, 0, \frac{2}{3}\right)$$

(c) $d(\mathbf{u}+\mathbf{w}, \mathbf{v})$. $= \|(u+w) - v\|$

$$= \|(8, 0, 3, 0)\| = \sqrt{64 + 9} = \sqrt{73}$$

(d) $\mathbf{u} \cdot \mathbf{v}$.

$$= (3, -1, 2, -1) \cdot (2, -1, 0, 2)$$

$$= 6 + 1 + 0 - 2 = 5.$$