Math 2568 (§75) – Jan. 27, 2017 Full Name: ______________________

Quiz 2

NOTE: Answers without proper justfication will receive NO credit.

Problem 1. (i) *(1 point)* Determine all possibilities for the number of solutions to a system of 2 equations in 3 unknowns that has $x_1 = 1$, $x_2 = 2$, $x_3 = -1$ as a solution.

We know the system is compatible, so if $[A|b] \underset{\text{rows}}{\sim} [A'|b']$ in REF then rank(A') = # dependent variables $\leq$ # rows of $A' = 2$
So from this we know there are some independent variables (at least one!) & we have infinitely many solutions to the system.

(ii) *(2 points)* Give the vector form for the general solution to the system associated to the augmented matrix $\left[\begin{array}{cccc|c} 1 & 0 & -1 & -2 & 0 \\ 0 & 1 & 2 & 3 & 0 \end{array}\right]$

The matrix is in REF with x_1, x_2 indep variables

$x_1 = x_3 + 2x_4$
$x_2 = -2x_3 - 3x_4$

so $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} x_3+2x_4 \\ -2x_3-3x_4 \\ x_3 \\ x_4 \end{bmatrix} = x_3 \begin{bmatrix} 1 \\ -2 \\ 1 \\ 0 \end{bmatrix} + x_4 \begin{bmatrix} 2 \\ -3 \\ 0 \\ 1 \end{bmatrix}$.

for any x_3, x_4 in $\mathbb{R}$

Problem 2. *(2 points)* Given $D = \begin{bmatrix} 2 & 1 \\ 1 & 4 \end{bmatrix}$, and $\mathbf{v} = \begin{bmatrix} -3 \\ 3 \end{bmatrix}$, compute $\|D\mathbf{v}\|$.

By definition $Dv = \begin{bmatrix} -6+3 \\ -3+12 \end{bmatrix} = \begin{bmatrix} -3 \\ 9 \end{bmatrix} = 3\begin{bmatrix} -1 \\ 3 \end{bmatrix}$

So $\|Du\| = \sqrt{3\begin{bmatrix} -1 \\ 3 \end{bmatrix} \cdot 3\begin{bmatrix} -1 \\ 3 \end{bmatrix}} = 3\sqrt{(-1)^2 + 3^2} = \boxed{3\sqrt{10}}$.