

MATH 520 PROBLEM SET 2
SPRING 2017
BROWN UNIVERSITY
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This problem set is due at the end of the day on Wednesday, 8 February 2017. Please write up your solutions (one problem per page) clearly and legibly, scan them, and upload them using Gradescope (submission instructions on the course website). There are also MyMathLab problems due at the same time.

- 1 Row reduce the following matrix (all the way to reduced row echelon form). Show all your steps.

$$\begin{pmatrix} 3 & 0 & -2 & 1 & 3 \\ 0 & 0 & 4 & 2 & 2 \\ 1 & 0 & 2 & 1 & 0 \end{pmatrix}$$

- 2 Sketch the vectors $\mathbf{u}_1 = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$ and $\mathbf{u}_2 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$ in the plane \mathbb{R}^2 . Shade the region in \mathbb{R}^2 consisting of all points which can be written as a linear combination of \mathbf{u}_1 and \mathbf{u}_2 with both weights between 0 and 1.

- 3 Suppose A is a 3×3 matrix and \mathbf{b} is a vector such that $A\mathbf{x} = \mathbf{b}$ has exactly one solution. If \mathbf{c} is another 3×1 vector, how many solutions does $A\mathbf{x} = \mathbf{c}$ have?

- 4 One day of mining at mine A produces 20 metric tons of copper and 550 kilograms of silver, while one day at mine B produces 30 metric tons of copper and 500 kilograms of silver. Let vectors $\mathbf{u} = \begin{pmatrix} 20 \\ 550 \end{pmatrix}$ and $\mathbf{v} = \begin{pmatrix} 30 \\ 500 \end{pmatrix}$ and represent the output per day of the two mines.

(a) Give an interpretation in this situation for the vector $3\mathbf{u}$.

(b) Write a vector equation whose solution gives the number of days each mine should operate in order to produce 150 tons of copper and 2825 kilograms of silver.

(c) Using Julia or otherwise, solve the equation from (b).