

MATHEMATICS 201-NYC-05

Vectors and Matrices

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Assignment #1

This assignment is due **Friday September 7** at the beginning of the class.

For questions involving Maple (questions 5 and 6), a print-out of your work is expected, where your name is written in the Worksheet, and each question is clearly labeled.

Question 1 (9 points)

Let P be an $n \times 1$ matrix such that $P^T P = 1$. We define the *Householder matrix* H as $H = I - 2PP^T$.

a) Let $P = \begin{bmatrix} \frac{2}{3} \\ \frac{1}{3} \\ -\frac{2}{3} \end{bmatrix}$. Verify that $P^T P = 1$ and find H .

b) Prove that if H is any Householder matrix, then H is symmetric.

c) Prove that if H is any Householder matrix, then $H^{-1} = H^T$.

Question 2 (10 points)

Solve for x , y and z .

$$xy - 2\sqrt{y} + 3zy = 8$$

$$2xy - 3\sqrt{y} + 2zy = 7$$

$$-xy + \sqrt{y} + 2zy = 5$$

Question 3 (10 points)

For which values of a will the following system of linear equations have

$$a^2x - 6ay + 12z = 8$$

$$2x - 3y + 5z = 2$$

$$x - 3y + 3z = 2$$

i) a unique solution

ii) no solution

iii) an infinite number of solutions

