Matrix theory - Assignment 5

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***Abstract*—This document illustrates solving pair of straight lines using linear algebra**

Download all python codes from

https://github.com/shreeprasadbhat/matrix−theory/tree/master/assignment5/codes

and latex codes from

https://github.com/shreeprasadbhat/matrix−theory/blob/master/assignment5/

1 Problem

Find the value of h so that the equation

$$6x^2 + 2hxy + 12y^2 + 22x + 31y + 20 = 0$$

may represent two straight lines.

2 Construction

The general equation second degree is given by

$$ax^2 + 2bxy + cy^2 + 2dx + 2ey + f = 0 \tag{2.0.1}$$

(2.0.1) represents pair of straight lines if

$$\begin{vmatrix} a & h & d \\ h & c & e \\ d & e & f \end{vmatrix} = 0 \tag{2.0.2}$$

3 Solution

From (2.0.2), given equation represents pair of straight lines if

$$\begin{vmatrix} 6 & h & 22 \\ h & 12 & 31 \\ 22 & 31 & 20 \end{vmatrix} = 0 \tag{3.0.1}$$

$$\implies h = \frac{17}{2} \text{ or } h = \frac{171}{20} \tag{3.0.2}$$

Verify (3.0.2) using python code from

https://github.com/shreeprasadbhat/matrix−theory/tree/master/assignment5/codes/solve_determinant.py