Matrix-Lines

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CONTENTS

***Abstract*—This document shows how to find equation of a line passing trough a point (2,2) and cutting off intercepts on the axes whose sum is 9 using python.**

I. PROBLEM STATEMENT

Find equation of a line passing trough a point (2,2) and cutting off intercepts on the axes whose sum is 9.

II. CONSTRUCTION

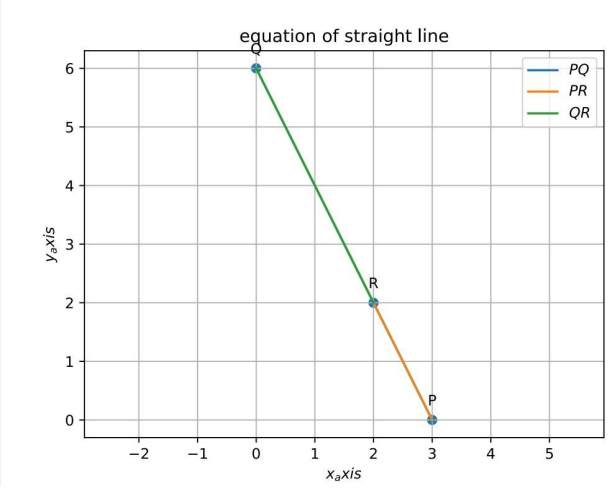

Fig. 1. Equation of the Straight Line

Symbol	Value	Description
P	(a,0)	Point on X-axis
Q	(0,b)	Point on Y-axis
R	(2,2)	Given Point
a+b	9	Given Condition

TABLE I
PARAMETERS

III. SOLUTION

Given that resultant line passes through point(2,2) and intercepts on axes whose sum is 9 (let x intercept is P (a,0) and y intercept is Q (0,b) therefore, a+b=9) so, b=9-a

Let P=(a,0),Q=(0,9-a),R=(2,2)

Equation of line is $n^T\mathbf{X} = \mathbf{c}$ it can also be written as $X^T\mathbf{n} = \mathbf{c}$

Now we have 3 points which lies on same line so,
$[a\ 0]n = c$ ——-eq1 Equation of line through P
$[0\ 9-a]n = c$ ——-eq2 Equation ofline through Q
Now eq1+eq2,
$[a\ 9-a]n = 2c$ ——eq3
$[2\ 2]n = c$ ——eq4 Equation of line through R

From eq3 and eq4 we can find normal vector n,

$[[a\ 9-a],[2\ 2]]n$ = c$[2\ 1]$

Therefore, n = $[[a\ 9-a],[2\ 2]]^{-1}$. c.$[2\ 1]$

n = $[3a-9\ -2].c/$(4a-18)

Now eq4 can be expressed as,

$[3a-9\ -2].[2\ 2]$.c/(4a-18) = c

By solving this equation we get a=2,thus b=9-a=7

by substuting a in n, finally

n = $[0.3\ 0.2].c$
The Resultant Equation of line is n^T**X = c**

i.e, $[0.3\ 0.2].X$ **= 1**

IV. Software

Download the following code using,

svn co https://github.com/
mygit-sampath-govardhan/fwc-iith-assignments/blob/
5b65abbf8e5e3c803b1bff8cf4a95092e100de75/
Assignment-4(Matrices-line)/codes/Assignment4.py

Now execute the code

Python3 Assignment4.py

V. Conclusion

We found the equation of a line passing trough a point (2,2) and cutting off intercepts on the axes whose sum is 9.