Week - 3
Tutorial
Straight line - 2
Mathematics for Data Science - 1

Syllabus Covered:

- General equation of line
- Equation of parallel and perpendicular lines in general form
- Equation of a perpendicular line passing through a point
- Distance of a line from a given point
- Straight line fit

1. A company provides two equipment A and B having the working life of 3 years and 4 years respectively. The value of equipment A and B decreases yearly according to equations $5x + 12.5v_A - 62.5 = 0$ and $6x + 12v_B + -72 = 0$ respectively, where v_A and v_B are the values (in thousands) of A and B respectively, and x is the number of years from the date of purchase.

   (a) What are the costs of equipments?

   (b) What are the yearly deprecations of the two equipments?

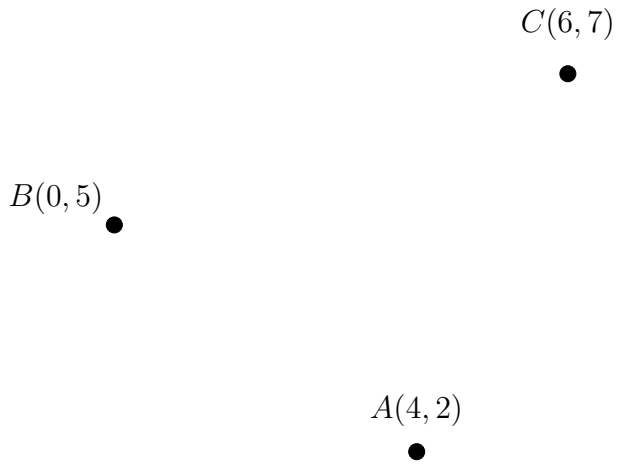
   (c) If the company will buy back an equipment after its work life, and Vijay has requirement of such equipment for 12 year, which kind of equipment will cost him lesser?

2. Let two lines l_1 and l_2 represent the equations $6x + 12y - 72 = 0$ and $5y - 6x - 30 = 0$ respectively. If a line l_3 is parallel to l_1, passes through (-5,0), and another line l_4 is perpendicular to line l_3 and passes through $(0, -\frac{5}{2})$, answer the following.
   (a) What is the cardinality of A which is the set of all points common to at least two of the mentioned lines?
   (b) If a relation R is the set of all points inside the region bounded by these four lines (excluding the lines), find the range and domain of relation R.
   (c) A line l_5 represents by the equation $x + 2y = 12$. find the cardinality of set B which has all the points common between lines l_1 and l_5.

3. Two friends Lincon and Lila purchase shares of two companies. Lincon purchases six shares of company M and one share of company N in Rs. 400 overall. Lila purchases the four shares of company M and three shares of company N in Rs. 360 overall. How much did each of them spend on company N?

4. Find the equation of line which is perpendicular to line $y - 5x = 0$ and is $\frac{1}{\sqrt{26}}$ unit away from the origin?

5. Find the area of $\triangle ABC$ by calculating a base and its corresponding height.



6. Junaid is travelling on a rode represented by the equation $x + y - 10 = 0$. He calls Ravi asking him to meet on the same road. Ravi is at location (5,1) and wishes to cover the minimum distance to junaid's road. If he arrives at his desired point in 2 minutes, what was Ravi's speed? (Taking one unit to be equivalent to $\sqrt{2}$ kilometer)

7. Two anthropology students Chetan and Raju calculate the relationship between the length f (in cm) of the femur and the height H (in cm) of a female adult using fossilised bones as $H = mf + n$. Both use the data given in table below and Chatan calculates m to be 2 and n to be 72, whereas Raju calculates m to be 2.1 and n to be 72. Whose model is better?

$f(cm)$	38	40	42	44
$H(cm)$	147	150	155	160

8. Find the equation of line which is parallel to line $3x - 4y + 5 = 0$ and 1 unit away from it and a units away from line $3x - 4y = 0$ where $a > 0$? Also find the value of a.