CS 763: Problem Set: Due: 10:00 PM, 19-Feb

- Please write (only if true) the honor code. If you used any source (person or thing) explicitly state it.

- Important: This is an INDIVIDUAL assignment.

- Always provide a brief explanation. (The length of the explanation required has been forecasted with the amount of space provided.)

- Submit following files in folder name lab03_roll_XX :

  1. readme.txt (case sensitive name). This <u>text</u> file contains identifying information, honor code, links to references used
  2. ReflectionEssay.pdf is optional but a brief one would be nice.
  3. lab03_roll_XX.pdf (includes all solutions).
  4. All relevant tex source (and images only if necessary). No other junk files, please.

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1. State whether or not the following points are the same and explain why.

   (a) $A[2, -1, 3]$, $B[4, -2, 6]$ (b) $A[\sqrt{2}/2, -1, 0]$, $B[1, -\sqrt{2}, 0]$

2. In projective three-space, what are the standard homogeneous coordinates of (a) the origin and (b) ideal points determined by the intersections of the extensions of the coordinate axes and the ideal plane?

3. Write standard homogeneous coordinates for the points specified in uppercase characters. (Use left and right to distinguish.)
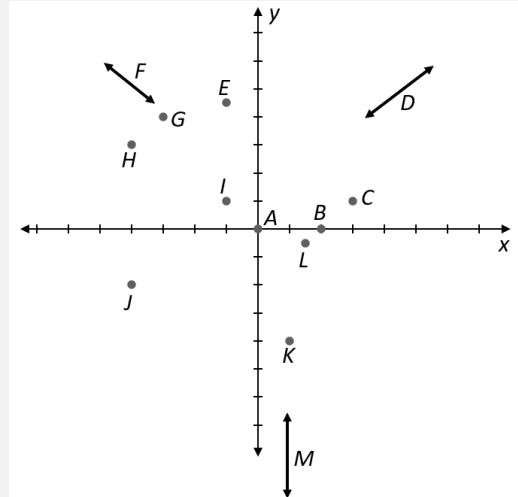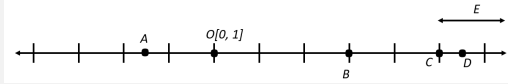
4. Which of the following points lie on the line $3p_1 - 2p_2 + 5p_3 = 0$? Why?

    (a) $A[1, 1, 2]$ (b) $B[4, 1, -2]$

5. Write the coordinates of the lines that are the extensions to the projective plane of the following Euclidean lines.

    (a) $3x + 2y = 6$ (b) $4x + 5y + 7 = 0$

6. Sketch each line in the projective plane whose equation is given.

   (a) $2p_1 + 3p_2 + 5p_3 = 0$ (b) $3p_1 - 2p_2 - p_3 = 0$

7. In each of the following cases, sketch the line determined by the two given points; then find the equation of the line.

   (a) $A[3, 1, 2]$, $B[1, 2, -1]$ (b) $A[2, 1, 3]$, $B[1, 2, 0]$

8. Find the standard homogeneous coordinates of the point of intersection for each pair of lines.

   (a) $p_1 + p_2 - 2p_3 = 0, 3p_1 + p_2 + 4p_3 = 0$ (b) $p_1 + p_2 = 0, 4p_1 - 2p_2 + p_3 = 0$

9. Determine which of the following sets of three points are collinear.

   (a) $A[1,2,1]$, $B[0,1,3]$, $[2,1,1]$

   (b) $A[1,2,3]$, $B[2,4,3]$, $[1,2,-2]$

10. Determine which of the following sets of three lines meet in a point.

   (a) $l[1,0,1], m[1,1,0], n[0,1,-1]$

   (b) $l[1,0,-1], m[1,-2,1], n[3,-2,-1]$