

Basic Math- vectors, lines

1. Given is a line determined by two points $A(1,2,3)$ and $B(-1,3,0.5)$. Where is point C on the line, so that the distance between C and A equals 10. **[10pts]**
2. Given are two lines L_1 and L_2 , determined by points $A(-2,3,5)$ and $B(-1,4,6)$ and by points $C(1,2,3)$ and $D(3,4,5)$, respectively. Do the lines intersect? **[10pts]**
3. Given are two lines. Line1 is determined by points $A(1,2,0)$ and $B(3,3,4)$. Line2 is determined by points $C(4,2,3)$ and $D(0,2,6)$. Find the point that is at equal distance from both lines. We call this the symbolic intersection of the two lines. **[20 pts]**
4. Given are 3 lines (L_1 , L_2 , and L_3). Devise a method to determine a “symbolic intersection” of the three lines. Explain your method. **[20 pts]**
5. Given is a line by two points $A(1,1,0)$ and $B(4,4,0)$. Calculate the distance between the line and point $C(5,1,0)$. **[10pts]**
6. Given is a triangle determined by three vertices: $A(1,0,1)$, $B(0,1,1)$, and $C(2,2,3)$. Calculate the three angles of the triangle. **[10 pts]**
7. Given are three arbitrary points, A, B, C . Explain three methods to determine if they define a plane. **[15pts]**

Earn bonus points for solving the problems in different ways. Earn bonus points for writing computer program.

Directions

- Always explain how you plan to solve the problem. Use sketches, math symbols and formulas, text, as you find them appropriate. I need to know that you understand what you are about to do. I must be able to follow your reasoning.
- **ALWAYS start with a general parametric solution (without specific numbers). Derive the necessary formula. Explain how/why does it work, and then plug in the actual numbers and values and calculate the numerical results.**
- Calculation errors are not serious mistakes, you can still earn 80% of the score if you produce a correct general parametric solution.
- Always verify the results by replacing the final numbers back into your equations/ formulas. Verification and analysis of the results are always mandatory.
- Type your text with large enough margin and line spacing.
- If you do not have access to a word processor, write clearly and legibly.
- Neatness reflects clarity and care. You can earn (or lose) important points.
- Number the pages and staple the sheets. Do not use paper clip! We are not responsible for losing some renegade sheets.
- **Work alone!**
- If you have questions or problems, contact the TA-s or come to office hours.
- Have fun!