Math 2415

Friday Problem Session on 12.4, 12.5 (Lines)

Aim to do at least problems 1-12.

1. 12.4.5

2. 12.4.10

3. 12.4.15

4. 12.4.19

5. 12.4.28. Make sure you first work out formulae for the vectors that form two adjacent sides of the parallelogram. Carefully justify (explain) why the vectors you obtained are correct.

6. 12.4.35

7. 12.5.1bdefgjk

8. 12.5.7 (parametrization only)

9. 12.5.10

10. 12.5.13

11. 12.4.43

12. Draw a picture illustrating how to project the vector $(0, 1)$ onto the vector $(2, 2)$. Use your sketch and properties of right triangles, find the component of $(0, 1)$ in the direction of $(2, 2)$. Check your answer using the formula for $\text{Comp}_b\mathbf{a}$.

13. Let $\mathbf{a} = \mathbf{i} + 3\mathbf{j}$ and $\mathbf{b} = 2\mathbf{j} + 5\mathbf{k}$. Find $\mathbf{a} \times \mathbf{b}$. Sketch $\mathbf{a}$, $\mathbf{b}$, and $\mathbf{a} \times \mathbf{b}$.

14. 12.4.22. First use the determinant formula for the cross product to prove this result. Then provide a geometric interpretation of the formula you are asked to prove.

15. 12.4.29

16. 12.5.4

Challenge Problems

1. 12.4.47. Hint: You may use the formulae for dot and cross products in terms of cosine and sine functions. A proof that uses the determinant formula for the cross product is given in the textbook. Try to understand the details of this proof!

2. 12.4.53

3. 12.3.61

4. 12.3.62

5. 12.4.44

6. 12.4.45