

Math 25b Homework 5

Due Wednesday 8th March 2006.

Half of this problem set will be graded by Alison and half by Ivan. Please turn in problems from Section 1 separately from the problems in Section 2. Remember to staple each bundle of solutions and also to put your name on each!

1 Alison's problems

- (1) Problem 3 on page 165 of Rudin.
- (2) Problem 5 on page 166 of Rudin.
- (3) Problem 6 on page 166 of Rudin.
- (4) Problem 9 on page 166 of Rudin.

2 Ivan's problems

- (1) Problem 10 on page 167 of Rudin.
- (2) Problem 12 on page 167 of Rudin.
- (3) Problem 14 on page 168 of Rudin.
- (4) This problem is meant to help you get into the groove for multivariable calculus. (Big hint: review basic vector knowledge, dot and cross products, etc, etc.)
 - (a) Given points $P(0, -2, 0)$, $Q(4, 1, -2)$ and $R(5, 3, 1)$ in \mathbb{R}^3 find
 - (i) a vector orthogonal to the plane through the points P , Q and R ,
 - (ii) the area of triangle PQR , (Hint: what area does $|\vec{a} \times \vec{b}|$ measure?)
 - (iii) the equation of the plane through PQR .
 - (b) Given the planes $x + y + z = 1$ and $x - y + z = 1$ in \mathbb{R}^3 , find
 - (i) the angle between these planes (if they aren't parallel),
 - (ii) the parametric and symmetric equations of the line of intersection of the planes.

(c) Suppose that in \mathbb{R}^3 the two nonzero vectors \mathbf{a} and \mathbf{b} are perpendicular to each other. Suppose $\mathbf{c} = [\mathbf{a} \times (\mathbf{b} \times \mathbf{a})]$. Which of the following statements must be true?

- (i) \mathbf{c} is perpendicular to both \mathbf{a} and \mathbf{b} .
- (ii) \mathbf{c} is perpendicular to neither \mathbf{a} nor \mathbf{b} .
- (iii) \mathbf{c} is perpendicular to \mathbf{a} .
- (iv) \mathbf{c} is perpendicular to \mathbf{b} .
- (v) \mathbf{c} is parallel to \mathbf{a} (i.e. a scalar multiple of \mathbf{a}).
- (vi) \mathbf{c} is parallel to \mathbf{b} (i.e. a scalar multiple of \mathbf{b}).

3 The problems I didn't assign—good practice!

- (1) Problem 1 on page 165 of Rudin.
- (2) Problem 4 on page 165 of Rudin.
- (3) Problem 8 on page 166 of Rudin.