

Fall, 2009

MATH 3500(H)
PROBLEM SET #1

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DUE Wednesday, August 26, 2009.

Problems to work but not hand in:

§1.1: #2, 3, 6, 9.

§1.2: #1c,f, 2c,f, 3, 6, 8, 12.

§1.3: #1, 2.

Problems to turn in:

§1.1: #4* (2), 5 (2), 10 (3).

A. (3) Given $\triangle ABC$, suppose the point D is $3/4$ of the way from A to B and E is the midpoint of \overline{BC} . Use vector methods to determine what fraction of the way from C to D the intersection of \overline{CD} and \overline{AE} is.

B. (2) Suppose $\mathbf{x}, \mathbf{y} \in \mathbb{R}^n$, $\|\mathbf{x}\| = 2$, $\|\mathbf{y}\| = 3$, and the angle between \mathbf{x} and \mathbf{y} is $\theta = \arccos(1/6)$. Show that the vectors $2\mathbf{x} - \mathbf{y}$ and $\mathbf{x} + \mathbf{y}$ are orthogonal.

§1.2: #1e,2e (2), 14 (3), 15 (3), 17 (2), 20 (3), 22 (3).

§1.3: #3 (2), 6 (3).

Challenge problems (Turn in separately):

§1.1: #13 (3).

C. (4) Recall that the centroid of a triangle is the point where its medians intersect. Given $\triangle ABC$, which triangles with vertices on the edges of the original triangle have the same centroid? (Hint: Exercise 1.1.9 may be of use.)

§1.2: #18 (3), 23 (4), 24 (3), 25[†] (4), 26 (4).

*Use vector methods!

[†]Alternative hint due to Tori Akin last year: You can do part b. directly without the formula in part a.