Fall, 2011

# MATH 3500(H)
# PROBLEM SET #1

T. Shifrin

DUE Wednesday, August 24, 2011.

*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*:

WeBWork Homework 1

Log in at `https://webwork2.math.uga.edu/webwork2/MATH3500_Shifrin_F11` using your UGAMyID as your username [*no caps*] and all but the last digit of your 810 number, formatted as 810-xx-xxxx, as your password. You can then change your password. If you get a message about a security certificate, you can read about this on our course homepage

`http://www.math.uga.edu/~shifrin/MATH3500`

You can try each problem up to 4 times; answers will be available shortly after the homework is due. Note that the WeBWork homework will generally be due Saturday evenings at 11 pm. *Half* your WeBWork score will be added to your written homework grade.

§1.1: #4* (2), 5 (2), 10 (3).

§1.2: #13 (3), 15 (3), 17 (3), 20 (3), 22 (3).

§1.3: #3 (2).

*Challenge problems* (Turn in separately):

§1.1: #13 (3).

**A.** (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.)

**B.** (5) Suppose you are handed a function $\|\cdot\|\colon \mathbb{R}^n \to \mathbb{R}$ satisfying the properties $\|\mathbf{x}\| \geq 0$, $\|c\mathbf{x}\| = |c|\|\mathbf{x}\|$, the triangle inequality, *and* the result of Exercise 1.2.11. Prove that if we *define* a dot product by $\mathbf{x}\cdot\mathbf{y} = \frac{1}{4}\left(\|\mathbf{x}+\mathbf{y}\|^2 - \|\mathbf{x}-\mathbf{y}\|^2\right)$, then it satisfies the properties of Proposition 2.1. The third one may require an idea from Chapter 2, but I'm not sure.

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

*Use vector methods!

†Alternative hint: You can do part b. directly without the formula in part a.