Math 442 **Differential Geometry** **Winter 2012**

Assignment #4: Due Friday, 2/3/12

Midterm Exam: Monday, November 6, in class. It will cover Chapter 1.

Reading:

- Nothing new. Be sure you've read all of Chapter 1 carefully.

Written Assignment:

A. Exercise 1.22 (p. 13).

B. Exercise (14) (p. 21).

C. Let a and b be real numbers such that $0 < a < b$, and let $\alpha\colon \mathbb{R} \to \mathbb{R}^2$ be the plane curve $\alpha(t) = (a\cos t, b\sin t)$. (Its trace is an ellipse with major axis $2b$ and minor axis $2a$. Note that this parametrization is not necessarily unit-speed.) Find the maximum and minimum values of the curvature of α in terms of a and b.

D. Let $\alpha\colon \mathbb{R} \to \mathbb{R}^3$ be the smooth curve given by

$$\alpha(s) = \frac{1}{\sqrt{2}}\left(s, \sqrt{1+s^2}, \ln\bigl(s+\sqrt{1+s^2}\bigr)\right).$$

Show that α is unit speed, and compute its curvature and torsion.

E. Exercise 1.32 (p. 17).

F. Exercise 1.33 (p. 17).

G. Exercise (18) (p. 22).