Math 241, Problem Set #5
(due **in class** Fri., 10/11/13)

Stewart, section 10.8, problems 12, 18, 26, 34, 48.
Stewart, section 10.9, problems 18, 22, 34, 36.
Stewart, section 11.1, problems 22, 24, 26, 28.

Also:

A. Recall that in the metric system of measurement, position has units of meters and time has units of seconds. Determine the metric unit of curvature, using the formula (9) on page 594. Do the same with formula (10) on page 595 and check that you get the same answer. Explain why this answer makes sense with respect to the geometrical interpretation of curvature.

B. Apply formula (10) to the circle $(a \cos t)\mathbf{i} + (a \sin t)\mathbf{j}$ and confirm that this agrees with the geometric interpretation of the curvature as the reciprocal of the radius of the osculating circle.

C. Compute the curvature of the helix $\langle \cos t, \sin t, t \rangle$. (Hint: Before you dive in and compute a parametrization of the curve by arc-length, see if one of the formulas for curvature gives us the answer with less work.)

D. Consider the curve $\mathbf{r}(t) = \langle e^{-t} \cos t, e^{-t} \sin t, e^{-t} \rangle$, $t \geq 0$. Compute the curvature and show that it goes to infinity as $t \to \infty$.