The in-class midterm will consist of easy computations, statements of theorems and definitions, some drawing, and perhaps an easy proof or two. The idea is to encourage you to go back and review all the things we've learned up to now. I've listed some study ideas below. Not everything on the exam is necessarily on this list, and the list certainly too long to have every topic included in a one-hour exam!

Everyday computation:

- Be able to compute curvature and torsion of space curves (unit speed or not).
- Be able to compute signed curvature and normal of a plane curve (unit speed or not).
- Compute the length of a curve.
- Determine if a patch is regular.
- Be able to compute unit normals to surfaces.
- Be able to compute directional derivatives of quantities defined on a surface.
- Compute $S(\mathbf{v})$ where S is the shape operator and v is a vector.

More interesting tasks:

- Sketch curves with a given property. (e.g. a simple closed curve with two vertices)
- Be able to state the Frenet equations, both for space curves and for plane curves. Be able to use the Frenet equations in computations.
- Know the implications that curvature and torsion have for plane and space curves, up to and including the material on cylindrical helices.
- What's a surface patch? A surface? A chart? An atlas?
- What's the shape operator?
- What's a smooth curve?
- Know parameterizations of all our favorite curves and surfaces.
- Know the definitions and geometric pictures of evolutes, involutes, and parallel curves.
- What are principle curvatures and their associated principle directions?
- What's a symmetric map on an inner product space? What can you say about their eigenvectors?
- What's a differentiable map from $\mathbb{R}^n$ to $\mathbb{R}^m$? What's the difference between directional derivatives and the total derivative map? Can you have one without the other? Which way?

Proofs and the big picture:

- Know the difference between curvature and signed curvature.

- Know what the Fundamental Theorem of Curves means.
- Know how to reconstruct a plane curve from its curvature.
- Know the Isoperimetric Inequality.
- Know how to use the equality $\frac{d}{dt}\alpha(t) \cdot \beta(t) = \alpha'(t) \cdot \beta(t) + \alpha(t) \cdot \beta'(t)$ to prove neat things.