Math 32404: Advanced Calculus II
Reading exercises 5, due on Monday, November 13th.

Read section 40 in our textbook, including the exercises in the textbook, and solve the exercises below as you go along. **In addition, review single-variable sections 27-28 as necessary.** Your solutions will not be collected, but a very short in-class quiz on the due date will contain one of these exercises, or one very very similar to it.

1. In exercise 40.F, let $f(x, y) := x^2 + xy + y^2$, and compute the derivative of F both directly and by using Chain Rule.
2. In example 40.3(d), set each of the five functions W, Z, R, S, and T to be one of $(a, b) \mapsto a^b$ and $(a, b) \mapsto \frac{a}{b}$. Find the domain of the composite function and compute its derivative at the point $(2, 3)$.
3. Formulate the "natural extension of the Mean Value Theorem" to higher-dimensional range spaces mentioned on the bottom of p. 365 after the proof of Theorem 40.4; and find a counter example to it.
4. For each of the functions in exercises 39.A-39.H, see which hypotheses and which conclusions of Theorem 40.8 are true, and which steps in its proof work.
5. Let $f(x, y) := \cos x \sin y$. Compute the first four derivatives $D^1 f, D^2 f, D^3 f, D^4 f$ at the point $a := (\pi/2, \pi/2)$. Package these into the Taylor polynomial of degree 3 at a; that is, set $n = 4$ in Theorem 40.9 and compute the first four of the five terms on the right hand side of the displayed equation. Let $b := (1.5, 1.5)$ and find c satisfying the conclusion of Theorem 40.9 (use technology for the computations).