Math 141 final exam review

The final is comprehensive, but will have an emphasis on Chapters 2 and 3 (up to the fundamental theorem of algebra in 3.3) of GP.

Practice problems
1. Make sure you can do the problems assigned for homework!
2. Refer to the **midterm review sheet** for practice problems on the first half of the course.
3. Here are some additional practice problems:

GP 2.2 # 2 and 4 (these are related), 3.

GP 2.3 # 10 (this was homework – compare your answer with the posted solution), # 12-14 (the normal bundle recently made an appearance in intersection theory this is the same thing).
In addition, draw a picture to illustrate the proof of the ϵ-neighborhood theorem.

GP 2.4 # 9, 13, 19 (no formal proof for 19 is needed, just an explanation).
Note: Some parts of problem 13 are challenging, but this is a good way to understand why we assume X is compact!

GP 2.5. Summarize the proof of Jordan-Brouwer, and review your class notes and the solutions that are now posted on the website.
Explain Figure 5-25 on page 90. How can you tell a point is on the inside or the outside?
Compute the mod 2 winding number $w(f, 0)$ of $f : S^1 \to \mathbb{R}^2$ given by

$$f(\cos(\theta), \sin(\theta)) = -2\cos(3\theta), \sin(-3\theta))$$

(Looking ahead: now put the anti-clockwise orientation on S^1, and compute the (oriented) winding number).

GP 2.6 Prove the last three theorems of this section (on page 92-93). The proofs given in the book are very short – fill in the details!

GP 3.1 Work through the proof of the Proposition on page 101. Do problems 12, 14, 22, and review problem 8 and 9 from the homework. (Challenge: problem 26. not required, but interesting!)

GP 3.2 Choose an orientation on S^1, and compute the degree of the function $S^1 \to S^1$ given by $z \mapsto z^n$ for $n \in \mathbb{Z}$. Equivalently, this is $(\cos(\theta), \sin(\theta)) \mapsto (\cos(n\theta), \sin(n\theta))$. What happens if you reverse the orientation on the domain but not the target S^1?
Do problem 1, 2a, 4, 10.