The midterm will cover 1-8 of Stewart, including the extra material covered in class.

1. **Definitions.** (e.g. ring, field, homomorphism, ideal).

2. **Work examples** (e.g. express the ideal $\langle f(t), g(t) \rangle$ as $\langle h(t) \rangle$).

3. **Give examples** (e.g. give an example of a non-commutative ring, an ideal, a ring that is not a field, etc).

4. **Statements of Theorems.** (E.g. Eisenstein’s irreducibility criterion, Tower law).

5. **Proofs.** From class and the homework; examples:
   
   (a) Proof of the rational root test.
   
   (b) Proof that any homomorphism from $\mathbb{Q}$ to a field is the identity.
   
   (c) Prove that $\mathbb{Q}(\alpha)$ is a field for some particular choice of $\alpha$.
   
   (d) You will have to make deductions using the main theorems. (Example: any subfield of $\mathbb{Q}(\sqrt{2})$ is either $\mathbb{Q}(\sqrt{2})$ or $\mathbb{Q}$, justify via the Tower Theorem.)

6. Some problems will not be literally identical to those in class (but will be very similar). Make sure you know the ideas of the proofs from class and the homework, and that you know how to start the proof of a problem you have never seen before.

7. Any problem from HW 1-8 or any proof or example from class is fair game. I will not ask for very long proofs or examples (e.g. anything that took more than one board to prove).

8. **Good luck!**