Outline for Exam 2

1. Surfaces:
   - parametric descriptions
   - normal vectors

2. Surface integrals of scalar fields:
   - computation method
   - applications to mass-density problems and to surface area

3. Surface integrals involving vector fields:
   - computation method
   - applications to flux computation (also Chapter 23 in your Physics text)

4. Divergence:
   - definition
   - notation
   - perspective involving expansion and contraction

5. Gauss’s Law: (refer to your Physics text on Chapter 23)
   - solving for the electric field when there is spherical, cylindrical or planar symmetry
   - be sure to know the symmetry arguments used to simplify the flux integral

6. Divergence theorem: (also refer to your Physics text on Chapter 23)
   - statement
   - idea behind why it's true involving expansion and contraction
   - using theorem to compute flux

7. Capacitors (refer to your Physics text on Chapter 25)
   - calculating capacitance for simple geometries
   - series and parallel circuits
   - energy in a capacitor
   - dielectrics

8. DC Circuits: (refer to your Physics text on Chapter 27)
   - emf and terminal voltage
   - resistors in series and parallel
   - Kirchhoff’s rules
   - RC circuits
9. Systems of linear equations:
   - solutions
   - consistent and inconsistent
   - augmented matrix
   - elementary row operations
   - reduced row echelon form
   - Gauss-Jordan elimination and interpretation
   - 0, 1, or infinitely many solutions
   - geometric perspective

10. Matrices:
    - arithmetic
      - addition
      - scalar multiplication
      - matrix multiplication
    - representation of linear systems
    - identity matrices
    - matrix inverses,
      - computation
      - application to solving linear systems
    - determinants
      - computation
      - main theorem: invertibility and application to the number of solutions to linear systems

11. Electric Potential (refer to your Physics text on Chapter 24)
    - Potential energy
    - Electric potential
    - Potential due to a point charge
    - Superposition principle
      - Discrete charges
      - Continuous charge distribution
    - Path independence
    - Conservative fields
    - Electric field from potential
    - Potential from electric field
    - Conductors