

## Review Topics for Math 17B

### Chapter 6

1. evaluating definite integrals
  - a. using the definition
  - b. using area formulas
  - c. using the Fundamental Theorem of Calculus
2. differentiating functions defined by integration (using the FTC)
3. applications of the definite integral
  - a. area of a plane region
  - b. average value of a function
  - c. volume of a solid of revolution
  - d. length of a curve
  - e. distance and displacement

### Chapter 7

1. integration techniques
  - a. substitution
  - b. integration by parts
  - c. partial fractions
2. improper integrals
  - a. infinite limits of integration
  - b. infinite discontinuities
  - c. comparison test for improper integrals
3. numerical integration
  - a. midpoint rule
  - b. trapezoidal rule
  - c. Simpson's rule
4. Taylor approximations
  - a. Taylor polynomials
  - b. Taylor's formula for the remainder

### Chapter 8

1. solving pure time DEs
2. solving separable (including autonomous) DEs
3. autonomous growth models
  - a. exponential growth
  - b. logistic growth

- c. logistic growth with a threshold (Allee effect)
- d. logistic growth with harvesting (Gordon-Schaefer model)
- e. von Bertalanffy growth
- 4. equilibria and stability
  - a. graphical approach
  - b. analytic approach
- 5. one-compartment problems
- 6. solving first-order linear DEs

## **Chapter 9**

- 1. solving linear systems using matrix reduction
- 2. matrix operations
  - a. addition
  - b. scalar multiplication
  - c. matrix multiplication
  - d. transposes
- 3. determinants of  $2 \times 2$  matrices
- 4. inverses of matrices
  - a. finding  $2 \times 2$  inverses
  - b. finding  $n \times n$  inverses
  - c. relation between invertibility and  $\det(A)$
  - d. relation between invertibility and solutions of  $Ax=0$
- 5. Leslie matrices
- 6. linear transformations
  - a. definition
  - b. finding the matrix for a linear transformation
  - c. rotations
- 7. eigenvalues and eigenvectors
  - a. definition
  - b. finding eigenvalues and corresponding eigenvectors
  - c. relation between eigenvalues and  $\text{tr}(A)$  and  $\det(A)$
  - d. finding when a matrix has eigenvalues with negative real parts
  - e. finding powers of matrices multiplied by vectors
  - f. finding long-term growth using Leslie matrices
- 8. vectors
  - a. length of vectors
  - b. normalizing vectors
  - c. dot product
  - d. angle between two vectors
  - e. perpendicular (orthogonal) vectors
- 9. parametric equations for lines
- 10. equation for a plane