

Midterm 1 topics

The first midterm exam may cover the following topics. Because of the short length of the exam, not all of these topics will appear on the exam, but each topic has a possibility of appearing.

1. Integration techniques.

- (a) Integration by parts (Strang §7.1; PSet 1 #6,7,8, PSet 2 # 10, PSet 3 #10)
- (b) Trigonometric integrals (Strang §7.2, PSet 1 #9,10, PSet 2 # 11)
- (c) Trigonometric Substitutions (Strang §7.3, PSet 1 #11,12)

2. Work integrals. (Strang §8.6; PSet 2 # 1,2,3,4,5)

- You do **not** need to remember the specific equations for force exerted by a spring or piston. These equations will be provided for you if they are needed.

3. Vectors.

- (a) Distances, angles, and the dot product (Strang §11.1; PSet 2 #6, 9,2)
- (b) Unit vectors (Strang §11.1; PSet 2 #7)
- (c) Parameterizing paths (Strang §12.1; PSet 2 #8, PSet 3 # 1,2)
- (d) Velocity and acceleration (Strang §12.1; PSet 3 # 2,3,4,5)
- (e) Arc length (PSet 3 # 4,5)

4. Polar coordinates

- (a) Converting between polar and rectangular coordinates (Strang §9.1, PSet 3 #6,7, PSet 4 # 1).
- (b) Converting equations of curves between polar and rectangular form (Strang §9.2, PSet 3 #8,9, PSet 4 # 2,3)
- (c) Area and arc length of polar curves (Strang §9.3, PSet 4 #2,4)

5. Complex numbers (Strang §9.4)

- (a) Algebra with complex numbers: addition, multiplication, division, complex conjugate, and absolute value. (PSet 4 # 8,9)
- (b) Complex n th roots (PSet 4 # 7)
- (c) Euler's formula (PSet 4 # 7).
- (d) Solving linear homogeneous differential equations (for the midterm, you will only be expected to know how to find *one* solution).

Note. For this exam, any problem about complex numbers or differential equations will be part of a pair of two problems, where the other problem is about some other topic. You will be allowed to choose which of the two problems to solve for points (where only one will be graded).