

# MATH 2400, Review suggestions for the first midterm

Dear students,

The first midterm exam is on Monday, February 8 from from 5:15pm to 6:45pm (the room is yet to be determined). The exam covers Chapter 9 and Sections 10.1–10.3 of the textbook. Here are some suggestions for review of the material.

Spend some time on the Concept Check and True-False Quiz (pg. 688, 733) and the most time on the Exercises. Make sure you understand the formulas and theorems from the textbook highlighted in the red boxes. If you struggle with anything or need to look at the answer before you solve it, make sure you then practice more similar problems until you can do it on your own. Then practice with some of the old exams from the course web page.

Below is a list of typical problems from each section. The list is not meant to be exhaustive but if you master these tasks you should do well on the exam.

## CHAPTER 9: VECTORS AND THE GEOMETRY OF SPACE

### Section 9.1: Three-Dimensional Coordinate Systems.

- Graph and describe a surface or solid represented by equations and inequalities. EXAMPLES 1–3, 7 *pg. 639 #31, 32, 34*
- Compute the distance of two points. Distance Formula EXAMPLE 4 *pg. 638 #8*
- The equation of a sphere, its center and radius. Equation of a Sphere EXAMPLE 6 *pg. 639 #41, pg. 689 #1*

### Section 9.2: Vectors.

- Basic operations on vectors, length of a vector. Vector Addition Scalar Multiplication Properties EXAMPLES 1, 2, 4 *pg. 647 #17*
- The displacement vector. 1 EXAMPLE 3 *pg. 646 #9*
- Unit vector in a given direction. 4 EXAMPLE 6 *pg. 647 #21*

### Section 9.3: The Dot Product.

- The dot product from lengths and angle, from components. Basic properties. Definition Component Form Properties EXAMPLES 1, 3 *pg. 653 # 1, 3, 7*
- Orthogonality, angle of vectors. 2 Definition EXAMPLES 4, 5 *pg. 689 #5, 9*
- The scalar and vector projection. Projections EXAMPLE 7 *pg. 653 #31, 35*

### Section 9.4: The Cross Product.

- The cross product from lengths and angle, from components. Basic properties. Definition 2 4 5 Properties EXAMPLES 2, 3 *pg. 661 #1, 3, 19*
- Find a vector perpendicular to a plane. EXAMPLE 4 *pg. 661 #23*
- Compute the area of a triangle, parallelogram, parallelepiped. Triple Products 7 EXAMPLES 5, 6 *pg. 661 #21, 27*

### Section 9.5: Equations of Lines and Planes.

- Find a vector equation or parametric equations of a line or line segment. 1 2 3 4  
EXAMPLES 1, 2 *pg. 671 #13, 14, 15*
- Find a linear equation of a plane. 5 7 8 EXAMPLES 4, 5 *pg. 671 #25, 27*
- Intersection of lines and planes, skew lines. EXAMPLES 2, 3, 4, 6, 7 *pg. 671 #32, 37*
- Angle and distance. 9 EXAMPLES 7, 8, 9, 10 *pg. 671 #41, pg. 672 #57, 61*

### Section 9.6: Functions and Surfaces.

- Find the domain and range of a function of two variables. Definition EXAMPLES 1, 2  
*pg. 690 #27*
- Sketch the graph of a function, use traces. 4, 5, 6, 7 *pg. 690 #32, 33*
- Classify a quadric surface. EXAMPLES 8, 9 *pg. 681 #21, 25*

### Section 9.7: Cylindrical and Spherical Coordinates.

- Convert between rectangular, cylindrical and spherical coordinates of a point.  
1 2 3 4 EXAMPLES 1, 4, 5 *pg. 690 #37, 38, 39*
- Describe a surface or solid using equations and inequalities in rectangular, cylindrical and spherical coordinates. EXAMPLES 2, 3, 6, 7 *pg. 687 #21, 22, 28, 33*

## CHAPTER 10: VECTOR FUNCTIONS

### Section 10.1: Vector Functions and Space Curves.

- The domain, limits and continuity of a vector function. 1 EXAMPLES 1, 2 *pg. 734 #2*
- Describe and sketch a curve given by a vector equation or parametric equations.  
EXAMPLES 3, 4 *pg. 700 #9, 10*
- Find the intersection of a curve and a surface. *pg. 700 #28*
- Find the curve of intersection of two surfaces. EXAMPLES 5, 6 *pg. 701 #37, 38*

### Section 10.2: Derivatives and Integrals of Vector Functions.

- The derivative of a vector function, properties. 1 2 3 EXAMPLE 1 *pg. 706 #9, 13*
- Find the unit tangent vector and the tangent line to a curve at a given point.  
EXAMPLES 1, 2, 3, 4 *pg. 706 #17, 21, 25*
- The integral of a vector function. Integrals EXAMPLE 5 *pg. 707 #33, 34*

### Section 10.3: Arc Length and Curvature.

- Compute the arc length of a curve. 1 2 3 EXAMPLE 1 *pg. 734 #8*
- Find the arc length parametrization of a curve. EXAMPLE 2 *pg. 734 #10*
- Compute the curvature of a curve. 9 10 11 EXAMPLES 3, 4, 5 *pg. 734 #12, 13*
- Find the unit tangent, unit normal and binormal vectors for a curve. EXAMPLE 6  
*pg. 715 #45, 46*
- Find equations for the normal plane, osculating plane and osculating circle of a curve.  
EXAMPLES 7, 8 *pg. 715 #47, 53*