M408M Exam 1 Review Sheet

Note: This review sheet is NOT meant to be a comprehensive overview of what you need to know for the exam. It is merely another tool to help you get started studying. The following concepts may or may not be seen on the exam and there may be concepts on the exam which are not covered on this sheet.

Chapter 11

• **Parametric curves**: Do you know how to find tangent lines to parametric curves, areas under parametric curves, and the length of a parametric curves?
• **Polar curves**: Can you find tangent lines to polar curves, the area bounded by a polar curve or between two polar curves, and the length of a polar curve?
• **Conic sections**: These can be expressed in either cartesian or polar coordinates. What are the general forms of the different conics when they are expressed in cartesian coordinates. What is the geometric meaning of the eccentricity, e, of a conic expressed in polar coordinates?
• What are the four forms that the polar equation of a conic section (with its focus at the origin) may take, and what do each of these forms tell you about the graph of the conic?

$*$ If you would like additional practice with questions from this chapter, try the following (or any other) problems from the review section at the end of the chapter (starting on page 733):

(4) Sketch the parametric curve and eliminate the parameter to find the Cartesian equation of the curve given by $x = 2\cos\theta$ and $y = 1 + \sin\theta$.
(6) Use the below graphs of $x = f(t)$ and $y = g(t)$ to sketch the corresponding parametric curve. Indicate with arrows the direction in which the curve is traced as t increases.

(8) Sketch the polar curve given by $r = \sin 4\theta$.
(9) Sketch the polar curve given by $r = 1 + \cos 2\theta$.
(10) Sketch the polar curve given by $r = 3 + \cos 3\theta$.
$*$ Compare your graphs from the preceding three problems. Can you convince yourself of why the graphs look the way they do, and what distinguishes each graph from the others?
(33) Find the area of the region that lies inside both of the circles $r = 2\sin\theta$ and $r = \sin\theta + \cos\theta$.
(47) Find an equation of the parabola with focus (0,6) and directrix $y = 2$.
(49) Find an equation of the hyperbola with foci $(\pm 3,0)$ and asymptotes $2y = \pm x$.
(50) Find an equation of the ellipse with foci $(3,\pm 2)$ and major axis with length 8.

Chapter 13

• How are dot products and cross products useful?
• How can you find a vector orthogonal (i.e. perpendicular) to a given plane?
• Give the general form of a vector equation, parametric eq., and symmetric eq. for a line.
• Give the general form of a vector equation and a scalar equation of a plane.
• How can you tell if three points, P, Q, and R lie on the same line?
• How can you tell if four points, P, Q, R, and S lie on the same plane?
• How do you find the distance from a point to a line, from a point to a plane, and from a line to a line (all in $\mathbb{R}^3$)?

$*$ If you would like additional practice with questions from this chapter, try the following (or any other) problems from the review section at the end of the chapter (starting on page 881):

(5) Find the values of x such that the vectors $< 3, 2, x >$ and $< 2x, 4, x >$ are orthogonal.
(7) Suppose that $\vec{u} \cdot (\vec{v} \times \vec{w}) = 2$. Find
(a) $(\vec{u} \times \vec{v}) \cdot \vec{w}$
(b) $\vec{u} \cdot (\vec{w} \times \vec{v})$
(c) $\vec{v} \cdot (\vec{u} \times \vec{w})$
(d) $(\vec{u} \times \vec{v}) \cdot \vec{v}$
(13) A boat is pulled onto shore using two ropes, as shown below. If a force of 255 N is used, find the magnitude of the force in each rope.

(15) Find parametric equations for the line through (4,-1,2) and (1,1,5).
(17) Find parametric equations for the line through (-2,2,4) and perpendicular to the plane $2x - y + 5z = 12$.
(18) Find an equation of the plane through (2,1,0) and parallel to $x + 4y - 3z = 1$.
(19) Find an equation of the plane through (3,-1,1), (4,0,2), and (6,3,1).
(20) Find an equation of the plane through (1,2,-2) that contains the line $x = 2t$, $y = 3 - t$, $z = 1 + 3t$.
(25) Find the distance between the planes $3x + y - 4z = 2$ and $3x + y - 4z = 24$.

Other tips:

• Look over past homework assignments. Do you remember how to do all the problems? Was there anything you had trouble with that you *still* don't understand? This would be a good thing to ask about on Wednesday or during office hours!
• When you're going through your past homeworks, make a note of any formulas you used in solving the problems. These would probably be useful to put on your formula sheet for the exam.
• Remember to try and simplify things before getting overwhelmed by a problem. This could be mean, for example, using trig identities to make an integral easier to compute (you could put these identities on your formula sheet too if you don't have them memorized!), or using techniques such as completing the square or multiplying the top and bottom of a fraction by a constant to get an equation into a recognizable form.