

Calculus III, MiniTest 1 Review

Dr. Graham-Squire, Fall 2013

- The test will cover sections 11.1 through 11.7.
- To study, you can look over your notes, rework HW problems on WebAssign, quizzes, and problems from the notes, as well as work out the practice problems given for each section. The Review Questions at the end of Chapter 11 are also good practice. You can also look at Minitest 1 from the class I taught last year, it is posted on my website.
- Calculators are allowed on this test, but for certain questions you may not be allowed to use a calculator. It is highly recommended that you bring a calculator because you cannot use cell phones or computers during the test.
- Some practice problems to work on:

1. Determine if the following points are collinear, and explain your answer:

$$P = (2, -1, 5) \quad Q = (8, 3, 13) \quad R = (-7, -7, -7).$$

2. An eagle with the head of Nido Qubein is pulling a rope attached to a statue of R Kelly across the quad. The eagle is pulling with a constant force of 100 pounds at an angle of 60° with the ground. If the eagle has to pull the statue 150 feet (so it can sit on a bench next to Gandhi, of course, where it belongs), find the amount of work done to get R Kelly to Gandhi.
3. When is $\mathbf{u} \cdot \mathbf{v} = 0$? When is $\mathbf{u} \times \mathbf{v} = \mathbf{0}$? Can you use a property or formula involving the cross and/or dot product to explain why that is the case?
4. Use vectors to find the area of the parallelogram that has sides given by the line segment connecting $(1, 2, -4)$ to $(2, 1, 3)$ and the line segment connecting $(1, 2, -4)$ to $(5, -1, 0)$.
5. Sketch the plane given by the equation $x + 2y + 3z = 6$.
6. Find the distance between the parallel lines with parametric equations:

$$x = 3 + 2t \quad y = t \quad z = 4t - 3$$

and

$$x = 3 - 4t \quad y = -1 - 2t \quad z = 2 - 8t$$

Also explain how you know the two lines are parallel.

7. Sketch the surface given by the equation $4x^2 - 9y^2 = -4z^2$.
8. (a) The point $(2, 2\pi/3, -2)$ is in cylindrical coordinates. Convert it to spherical coordinates.
(b) Find an equation in rectangular coordinates for the equation $z = r^2 \cos^2 \theta$ given in cylindrical coordinates. Sketch and/or describe the graph.
9. (a) Describe the surface given (in cylindrical or spherical coordinates) by $\theta = \pi$. Explain your reasoning by explaining why your answer makes sense in cylindrical or spherical coordinates.
(b) Convert the equation to rectangular coordinates and compare your answer to what you got in part (a).