

Math 206 Section A

Review for Test 1

The test is on Friday, October 8 during our class time. The test will cover sections 1.1-1.10, 2.1-2.5.

- Let $A = (3, -3, 2)$ and $B = (2, 1, 4)$.
 - Find the distance between the points A and B .
 - Find the midpoint of the segment from A to B .
 - Write two parametrizations for the line passing through the points A and B . For each parametrization, give the point when $t = 0$ and determine the value of t that gives the point B on the line.
- Describe or sketch the relationship between the graphs of the following pairs of equations:
 - $z = -\sqrt{x^2 + y^2}$ and $z = \sqrt{x^2 + y^2} - 4$
 - $z = x^2$ and $z = (x - 1)^2 + 2$
- Describe or sketch the set of points that satisfy the following equations:
 - $x^2 + y^2 + z^2 - 2x + 4y + 10z + 21 = 0$
 - $y = 3 - x^2 - z^2$
 - $y^2 + z^2 = 4$
 - $x - 5 = 0$
- Describe or sketch the set of points that satisfy the inequality: $x^2 + y^2 \leq z^2$, $0 \leq z \leq 2$.
- Describe the curve in which the two surfaces $x^2 + y^2 = 5$ and $x^2 + y^2 + z^2 = 9$ intersect. (Assume $z > 0$). Write a parametrization for this curve.
- Find cylindrical coordinates of the points with the following rectangular coordinates:
 - $(-1, 0, 2)$
 - $(-1, \sqrt{3}, 13)$
 - $(5, 6, 3)$
- Find spherical coordinates of the points with the following rectangular coordinates:
 - $(1, -1, \sqrt{6})$
 - $(0, \sqrt{3}, 1)$
- Convert the rectangular coordinate equation $z^2 = 2x^2 + 2y^2$ to (a) cylindrical coordinates and (b) spherical coordinates.
- Consider the two planes $x + y = 1$ and $y + z = 1$ that intersect in a straight line.
 - Find the angle between the planes.
 - Find a parametrization for the line of intersection.

10. Suppose a spaceship is at position $(100, 3, 700)$ and is traveling with velocity $(7, -10, 25)$. Assume the units are in miles/sec for velocity. What is the position of the spaceship after 20 seconds? What is the speed of the spaceship?
11. A ship is cruising due south at a rate of 15 knots (nautical miles per hour) with respect to still water. However, there is also a current of $5\sqrt{2}$ knots southeast. What is the total velocity of the ship? If the ship is initially at the origin and a lobster pot is at position $(20, -79)$, does the ship hit or miss the lobster pot?
12. Show that the line $x = 5 - t, y = 2t - 7, z = t - 3$ is contained in the plane having equation $2x - y + 4z = 5$.
13. Does the line $x = 5 - t, y = 2t - 3, z = 7t + 1$ intersect the plane $x - 3y + z = 1$? If so, where?
14. A force $\vec{F} = \vec{i} - 2\vec{j}$ acts on an object moving parallel to the vector $\vec{a} = 4\vec{i} + \vec{j}$. What is the force in the direction of motion?
15. Let $\vec{v} = 2\vec{i} - \vec{j} + \vec{k}$.
 - (a) Give a unit vector that points in the same direction as \vec{v} .
 - (b) Give a vector of length 3 that points in the direction opposite to \vec{v} .
16. Find the area of the triangle determined by the vectors $\vec{a} = \vec{i} - 2\vec{j} + 6\vec{k}$ and $\vec{b} = 4\vec{i} + 3\vec{j} - \vec{k}$.
17. Find a vector of length 2 that is orthogonal to both $\vec{u} = 2\vec{i} + \vec{j} - 3\vec{k}$ and $\vec{v} = \vec{i} + \vec{k}$.
18. Find an equation for the plane that is perpendicular to the line $x = 3t - 5, y = 7 - 2t, z = 8 - t$ and that passes through the point $(1, -1, 2)$.
19. Find an equation for the plane that contains the two lines: $x = t + 2, y = 3t - 5, z = 5t + 1$ and $x = 5 - t, y = 3t - 10, z = 9 - 2t$.
20. Find an equation for the line through the point $(5, 0, 6)$ that is perpendicular to the plane $2x - 3y + 5z = -1$.
21. Write parametric equations for the path of a particle that starts at the point $(0, 0, 3)$ and travels clockwise along a circle of radius 3 in the xz -plane.
22. Let $T(x, y) = (3x + 4y, 7x + 5y)$ be a linear transformation. Find the area of $T(P)$ where P is a parallelogram of area 10.

The following problems are from the textbook.

23. Pages 98-99: Problems 9, 31, 33
24. Pages 131-132: Problems 3, 5, 7, 16(a, b, d, e), 17, 21
25. Page 142: Problem 12(a, b)
26. Pages 148-149: Problems 3, 11, 17