

Math 222 Keys and Hints for HW11

By Lei November 18, 2010

I HAVE NO ANSWERS AND THE FOLLOWINGS ARE WHAT I GOT. I FOUND THE CALCULATION WAS NOT FUN AND I MIGHT MAKE MISTAKES. BE CAREFUL WHEN YOU READ WHAT I WROTE.

Section 12.1

3,5,7,14,17,21,24,27,30,31,34,37,43,47,49,50,53,54

3. Ans: $y = 0, z = 0$ The x-axis, which consists of all the points in the line whose y and z coordinates are zero, so this line is the x axis.

5. Ans: $x^2 + y^2 = 4, z = 0$ The circle in the xy plane, $x^2 + y^2 = 4$

7. Ans: $x^2 + z^2 = 4, y = 0$ The circle $x^2 + z^2 = 4$ in the xz-plane

14. $0 \leq x \leq 1$ All the points satisfying this equation, which lie between the plane

$x = 0$, namely the yz-plane and $x = 1$. $0 \leq x \leq 1, 0 \leq y \leq 1$ The solid generated by moving the square $0 \leq x \leq 1, 0 \leq y \leq 1$ along the z direction up and down.

$0 \leq x \leq 1, 0 \leq y \leq 1, 0 \leq z \leq 1$ The cube $0 \leq x \leq 1, 0 \leq y \leq 1, 0 \leq z \leq 1$, bounded by the coordinate planes and the planes $x = 1, y = 1, z = 1$

17. $x^2 + y^2 + z^2 = 1, z \geq 0$ The upper hemisphere with radius 1 and centered at the origin.

$x^2 + y^2 + z^2 \leq 1, z \geq 0$ The upper solid hemisphere with radius 1 and centered at the origin.

21. Ans: a. $z = 1$ b. $x = 3$ c. $y = -1$

24. Ans: a. $(x + 3)^2 + (y - 4)^2 = 1, z = 1$ b. $(y - 4)^2 + (z - 1)^2 = 1, x = -3$ c.

$(x + 3)^2 + (z - 1)^2 = 1, y = 4$

27. Ans: The sphere is $x^2 + y^2 + z^2 = 25$ and the plane is $z = 3$, so the circle should be $x^2 + y^2 = 16, z = 3$

30. Ans: $0 \leq x \leq 2, 0 \leq y \leq 2, 0 \leq z \leq 2$

31. Ans: $z \leq 0$

34. Ans: $1 \leq x^2 + y^2 + z^2 \leq 4$

37. Ans: $\sqrt{(1 - 4)^2 + (4 - (-2))^2 + (5 - 7)^2} = 7$

43. Ans: Center $(\sqrt{2}, \sqrt{2}, -\sqrt{2})$ and the radius is $\sqrt{2}$

47. Ans: $(x + 2)^2 + y^2 + z^2 = 3$

49. Ans: Completing the squares:

$x^2 + y^2 + z^2 + 4x - 4z = (x + 2)^2 - 4 + y^2 + (z - 2)^2 - 4 = 0$, which is

$(x + 2)^2 + y^2 + (z - 2)^2 = 8$. Center $(-2, 0, 2)$ and the radius is $2\sqrt{2}$

50. Ans: Similar to 49. The center is $(3, 0, -4)$ and the radius is 5

53. Ans: Obviously a $\sqrt{y^2 + z^2}$ b. $\sqrt{x^2 + z^2}$ c. $\sqrt{x^2 + y^2}$

54. Ans: a. $|z|$ b. $|x|$ c. $|y|$

Section 12.2

1,4,5,8,17,22,23,26,29,33,34,35,39,41,42

1. Ans: $3u = \langle 9, -6 \rangle$ and the length is $3 * \sqrt{3^2 + 2^2} = 3\sqrt{13}$

4. Ans: $u - v = \langle 3, -2 \rangle - \langle -2, 5 \rangle = \langle 5, -7 \rangle$ and the length is $\sqrt{25 + 49} =$
 5,8. Similar. Omitted
17. Ans: $\overrightarrow{P_1P_2} = \langle 2, 9, -2 \rangle - \langle 5, 7, -1 \rangle = \langle -3, 2, -1 \rangle = -3i + 2j - k$
22. Ans: $-2u + 3v = \langle 2, 0, -4 \rangle + \langle 3, 3, 3 \rangle = \langle 5, 3, -1 \rangle = 5i + 3j - k$
23. I can't draw here, so I'd like to ignore this one.
26. Ans: $9i - 2j + 6k$ The length is $\sqrt{81 + 4 + 36} = 11$, and thus $11 * \langle \frac{9}{11}i - \frac{2}{11}j + \frac{6}{11}k \rangle$
29. Similar to 26, omitted.
33. The unit vector is $\frac{12}{13}i - \frac{5}{13}k$, so the vector is $7 * (\frac{12}{13}i - \frac{5}{13}k) = \dots$
34. Similar to 33, omitted
35. Ans: The vector is $\langle 3, 4, -5 \rangle$, so the direction is $\frac{1}{5\sqrt{2}} \langle 3, 4, -5 \rangle$. The midpoint is
 (0.5, 3, 2.5)
39. Ans: $A(4, -3, 5)$
- 41 and 42 are similar. I'd like to take 42 as an example.
42. Ans: Let $u = a * v + b * w$, namely
 $\langle 1, -2 \rangle = \langle 2a, 3a \rangle + \langle w, w \rangle = \langle 2a + w, 3a + w \rangle$. We have $2a + w = 1$ and
 $3a + w = -2$ $a = -3, w = 7$