Calculus D - Homework Assignment Sheet Name: _____ Per. ____

Chapters 12 & 13 - Vectors & Vector Functions

Each assignment has a total possible of ***10 points***. For each section, self-grade for completion. (You may use ½ points.) I trust that you will give an honest evaluation of your own work. Your signature at the bottom indicates that this is an honest, accurate assessment of your work. Grades will be verified, as explained in class. Try additional problems for extra practice. Each assignment lists "Priority Problems" with a "PP" designation. Full credit awarded for completion of full assignment. *Assignments are subject to change. Any changes will be announced in class.*

0th Assignment: Return last page of Syllabus and complete E-mail Assignment.
(Separate 10 points – Fall Semester Only)

_____ 12.1: p. 769 #2, 4, 7, 9, 11, 20, 21, 22
12.2: p. 777 #1 – 29 every other odd, 19, 23, 39 (Read Example 7 p. 776)
PP: 12.1 #4, 11, 20, 22, 12.2 #1, 19, 23, 25, 29, 39

_____ 12.3: p. 784 #1 – 21 every other odd, 14, 23, 26, 35, 37, 39, 45, 47
12.4: p. 792 #1 – 7 odd, 13 – 19 odd, 27 – 35 odd (Optional: Read about torque p. 791 – 792)
PP: 12.3 #1, 21, 23, 35, 37, 39, 45, 12.4 #3, 13, 15, 29, 31

Quiz 12.1 – 12.4
Optional checkpoint and/or review.
Does not need to be included with HW.

_____ 12.5: p. 802 #1 – 15 odd, 12, 19, 21, 22, 23 – 49 odd, 55, 57
Hint: #22 convert to parametric first
PP: 1, 5, 9, 15, 19, 21, 22, 29, 33, 35, 37, 57

_____ 12.6: p. 810 #1, 3 – 19 odd (identify and sketch only), 21 – 28 also name each, 29, 31, 41, 42
PP: 1, 3 – 28 identifying more important than accurate sketching, 41, 42

_____ 12.7 Stewart 4th ed. (Handout attached):
p. 831 #1 – 29 every other odd, 31 – 36, 37 – 57 every other odd, try others for practice
PP: 31 – 36, 37 – 57 every other odd

_____ 13.1: p. 822 #1 – 4, 7, 9, 11, 17, 19 – 24, 25, 26, 35 – 39
PP: 17, 26, 36 – 39

Quiz 12.5 – 13.1
Optional checkpoint and/or review.
Does not need to be included with HW.

_____ 13.2: p. 828 #5 – 15 odd, 17 – 28 (Skip 21, 22), 31 – 39 odd
13.4: p. 846 #9, 13, 15, 17a, 18a
PP: 13.2 #5, 17, 19, 23, 25, 27, 39, 13.4 #9, 15, 18a

_____ 13.3: p. 836 #43, 44 (**T** and **N** only)
13.4: p. 846 #33 – 38
PP: 13.3#43, 13.4#33, 35, 37

Note for 13.4 #37 & 13.3 #3, 19:
$$e^{2t} + 2 + e^{-2t} = e^{2t} + 2e^{t}e^{-t} + e^{-2t} = (e^{t} + e^{-t})^2$$

_____ 13.3: p. 836 #1 – 33 odd (Skip 7, 9 and do 14 instead of 15). For #33 trace graph on paper first.
PP: 5, 11, 13, 14, 17, 21, 25, 29, 31, 33

_____ **Total** (90 Points) Signature: _____ Date: _____

Verified By: _____
Print Signature

12.7 Stewart 4th ed.

Name: _____

Cylindrical and Spherical Coordinates

Copy exercises and show all work on separate paper.

1. What are cylindrical coordinates? For what types of surfaces do they provide convenient descriptions?

2. What are spherical coordinates? For what types of surfaces do they provide convenient descriptions?

3–8 □ Plot the point whose cylindrical coordinates are given. Then find the rectangular coordinates of the point.

3. $(3, \pi/2, 1)$
4. $(\sqrt{2}, \pi/4, \sqrt{2})$
5. $(3, 0, -6)$
6. $(1, \pi, e)$
7. $(4, -\pi/3, 5)$
8. $(5, \pi/6, 6)$

9–12 □ Change from rectangular to cylindrical coordinates.

9. $(1, -1, 4)$
10. $(3, 3, -2)$
11. $(-1, -\sqrt{3}, 2)$
12. $(3, 4, 5)$

13–18 □ Plot the point whose spherical coordinates are given. Then find the rectangular coordinates of the point.

13. $(1, 0, 0)$
14. $(3, 0, \pi)$
15. $(1, \pi/6, \pi/6)$
16. $(5, \pi, \pi/2)$
17. $(2, \pi/3, \pi/4)$
18. $(2, \pi/4, \pi/3)$

19–22 □ Change from rectangular to spherical coordinates.

19. $(-3, 0, 0)$
20. $(1, 1, \sqrt{2})$
21. $(\sqrt{3}, 0, 1)$
22. $(-\sqrt{3}, -3, -2)$

23–26 □ Change from cylindrical to spherical coordinates.

23. $(\sqrt{2}, \pi/4, 0)$
24. $(1, \pi/2, 1)$
25. $(4, \pi/3, 4)$
26. $(12, \pi, 5)$

27–30 □ Change from spherical to cylindrical coordinates.

27. $(2, 0, 0)$
28. $(2\sqrt{2}, 3\pi/2, \pi/2)$
29. $(8, \pi/6, \pi/2)$
30. $(4, \pi/4, \pi/3)$

31–36 □ Describe in words the surface whose equation is given.

31. $r = 3$
32. $\rho = 3$
33. $\phi = 0$
34. $\phi = \pi/2$
35. $\phi = \pi/3$
36. $\theta = \pi/3$

37–48 □ Identify the surface whose equation is given.

37. $z = r^2$
38. $r = 4 \sin\theta$
39. $\rho \cos\phi = 2$
40. $\rho \sin\phi = 2$
41. $r = 2 \cos\theta$
42. $\rho = 2 \cos\phi$
43. $r^2 + z^2 = 25$
44. $r^2 - 2z^2 = 4$
45. $\rho^2(\sin^2\phi \cos^2\theta + \cos^2\phi) = 4$
46. $\rho^2(\sin^2\phi - 4\cos^2\phi) = 1$
47. $r^2 = r$
48. $\rho^2 - 6\rho + 8 = 0$

49–56 □ Write the equation (a) in cylindrical coordinates and (b) in spherical coordinates.

49. $x^2 + y^2 + z^2 = 16$
50. $x^2 + y^2 - z^2 = 16$
51. $x + 2y + 3z = 6$
52. $x^2 + y^2 = 2z$
53. $x^2 - y^2 - 2z^2 = 4$
54. $y^2 + z^2 = 1$
55. $x^2 + y^2 = 2y$
56. $z = x^2 - y^2$

57–60 □ Sketch the solid described by the given inequalities.

57. $r^2 \le z \le 2 - r^2$
58. $0 \le \theta \le \pi/2, \quad r \le z \le 2$
59. $-\pi/2 \le \theta \le \pi/2, \quad 0 \le \phi \le \pi/6, \quad 0 \le \rho \le \sec\phi$
60. $0 \le \phi \le \pi/3, \quad \rho \le 2$

61. A solid lies above the cone $z = \sqrt{x^2 + y^2}$ and below the sphere $x^2 + y^2 + z^2 = z$. Write a description of the solid in terms of inequalities involving spherical coordinates.

62. Use a graphing device to draw the solid enclosed by the paraboloids $z = x^2 + y^2$ and $z = 5 - x^2 - y^2$.

63. Use a graphing device to draw a silo consisting of a cylinder with radius 3 and height 10 surmounted by a hemisphere.

64. The latitude and longitude of a point P in the Northern Hemisphere are related to spherical coordinates ρ, θ, ϕ as follows. We take the origin to be the center of the Earth and the positive z-axis to pass through the North Pole. The positive x-axis passes through the point where the prime meridian (the meridian through Greenwich, England) intersects the equator. Then the latitude of P is $\alpha = 90° - \phi°$ and the longitude is $\beta = 360° - \theta°$. Find the great-circle distance from Los Angeles (lat. 34.06° N, long. 118.25° W) to Montréal (lat. 45.50° N, long. 73.60° W). Take the radius of the Earth to be 3960 mi. (A *great circle* is the circle of intersection of a sphere and a plane through the center of the sphere.)

Answers to odd-numbered exercises on next page.

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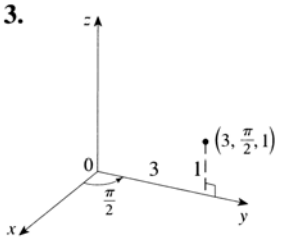
Name: _____

Cylindrical and Spherical Coordinates - Answers

Answers to Odd-Numbered Exercises

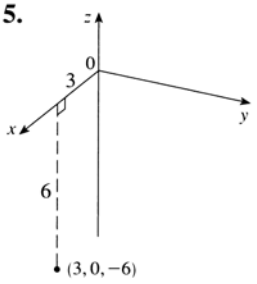
1. See pages 827–28.

3.



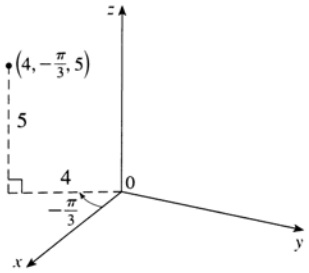
$(0, 3, 1)$

5.



$(3, 0, -6)$

7.

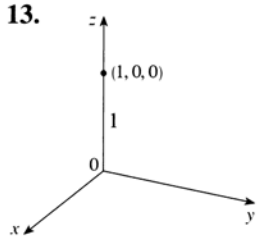


$(2, -2\sqrt{3}, 5)$

9. $(\sqrt{2}, 7\pi/4, 4)$

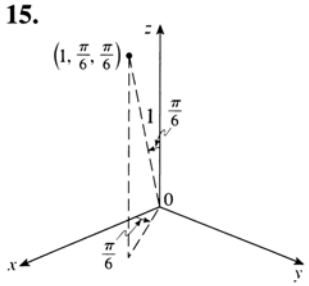
11. $(2, 4\pi/3, 2)$

13.



$(0, 0, 1)$

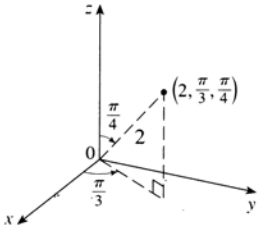
15.



$(\sqrt{3}/4, \frac{1}{4}, \sqrt{3}/2)$

$(\frac{1}{2}\sqrt{2}, \frac{1}{2}\sqrt{6}, \sqrt{2})$

17.



19. $(3, \pi, \pi/2)$ **21.** $(2, 0, \pi/3)$ **23.** $(\sqrt{2}, \pi/4, \pi/2)$

25. $(4\sqrt{2}, \pi/3, \pi/4)$ **27.** $(0, 0, 2)$ **29.** $(8, \pi/6, 0)$

31. Circular cylinder, radius 3, axis the z-axis

33. Positive z-axis **35.** Half-cone **37.** Circular paraboloid

39. Horizontal plane

41. Circular cylinder, radius 1, axis parallel to the z-axis

43. Sphere, radius 5, center the origin

45. Circular cylinder, radius 2, axis the y-axis

47. Cylinder, radius 1, together with the z-axis

49. (a) $r^2 + z^2 = 16$ (b) $\rho = 4$

51. (a) $r\cos\theta + 2r\sin\theta + 3z = 6$

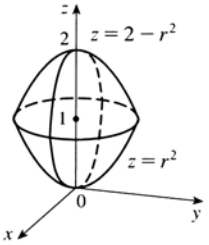
(b) $\rho(\sin\phi\cos\theta + 2\sin\phi\sin\theta + 3\cos\phi) = 6$

53. (a) $2z^2 = r^2\cos 2\theta - 4$

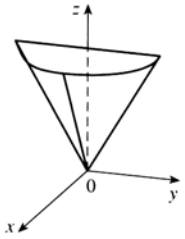
(b) $\rho^2(\sin^2\phi\cos 2\theta - 2\cos^2\phi) = 4$

55. (a) $r = 2\sin\theta$ (b) $\rho\sin\phi = 2\sin\theta$

57.



59.



61. $0 \le \phi \le \pi/4, 0 \le \rho \le \cos\phi$

63.