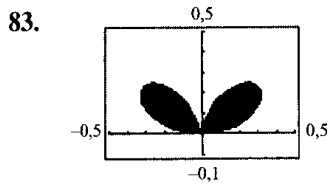
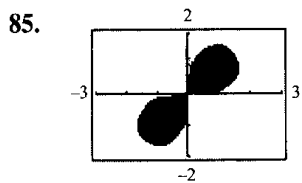


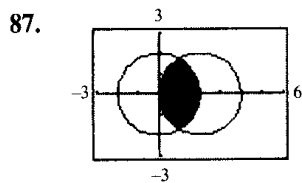
$$A = 2 \left( \frac{1}{2} \right) \int_0^\pi (2 + \cos \theta)^2 d\theta \approx 14,14$$



$$A = 2 \left( \frac{1}{2} \right) \int_0^{\pi/2} \sin^2 \theta \cos^4 \theta d\theta \approx 0,10$$



$$A = 2 \left( \frac{1}{2} \right) \int_0^{\pi/2} 4 \sin 2\theta d\theta \approx 4$$



$$A = 2 \left( \frac{1}{2} \int_0^{\pi/3} 4 d\theta + \frac{1}{2} \int_{\pi/3}^{\pi/2} 16 \cos^2 \theta d\theta \right) \approx 4,91$$

89.  $8a$

91.  $r = 10 \sin \theta$

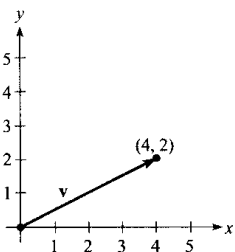
93.  $r = \frac{4}{1 - \cos \theta}$

95.  $r = \frac{5}{3 - 2 \cos \theta}$

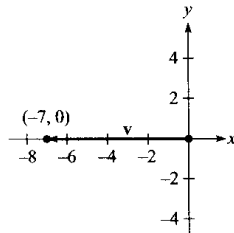
### CAPÍTULO 10

Sección 10.1 (página 979)

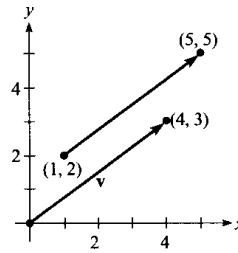
1.  $\langle 4, 2 \rangle$



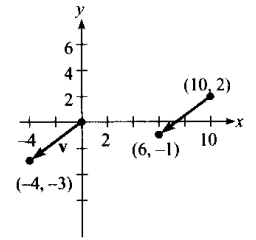
3.  $\langle -7, 0 \rangle$



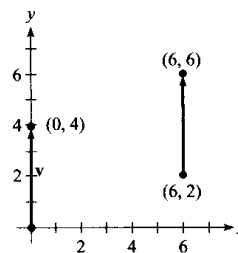
5.  $\langle 4, 3 \rangle$



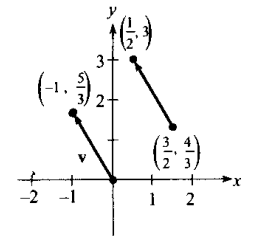
7.  $\langle -4, -3 \rangle$



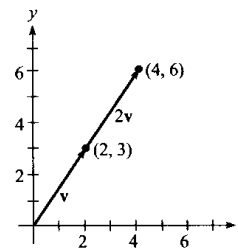
9.  $\langle 0, 4 \rangle$



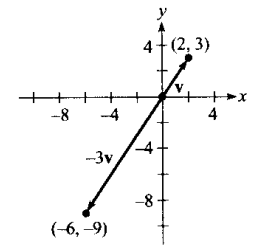
11.  $\langle -1, \frac{5}{3} \rangle$



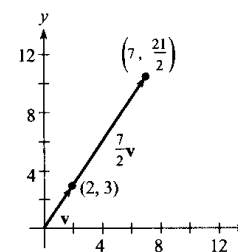
13. a)  $\langle 4, 6 \rangle$



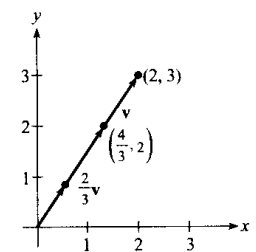
b)  $\langle -6, -9 \rangle$



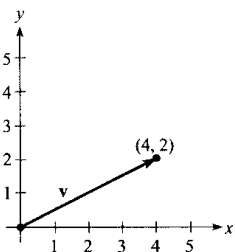
c)  $\langle 7, \frac{21}{2} \rangle$



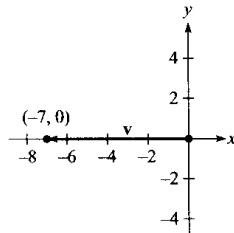
d)  $\langle \frac{4}{3}, 2 \rangle$



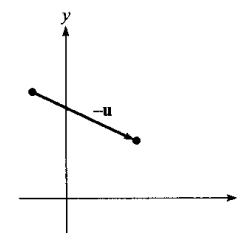
1.  $\langle 4, 2 \rangle$



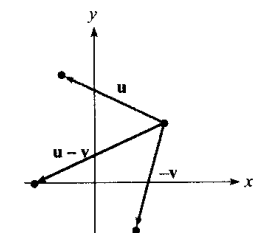
3.  $\langle -7, 0 \rangle$



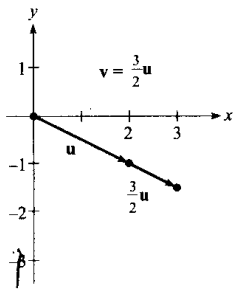
15.



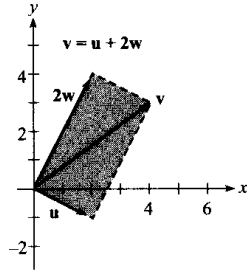
17.



19.  $\langle 3, -\frac{3}{2} \rangle$



21.  $\langle 4, 3 \rangle$



23.  $a = 1, b = 1$     25.  $a = 1, b = 2$     27.  $a = \frac{2}{3}, b = \frac{1}{3}$

29.  $(3, 5)$     31. 5    33.  $\sqrt{61}$     35. 4

37. a)  $\sqrt{2}$     b)  $\sqrt{5}$     c) 1    d) 1  
e) 1    f) 1

39. a)  $\sqrt{5}/2$     b)  $\sqrt{13}$     c)  $\sqrt{85}/2$     d) 1  
e) 1    f) 1

43.  $\langle 2\sqrt{2}, 2\sqrt{2} \rangle$     45.  $\langle 1, \sqrt{3} \rangle$

47. a)  $\pm \frac{1}{\sqrt{10}} \langle 1, 3 \rangle$     b)  $\pm \frac{1}{\sqrt{10}} \langle 3, -1 \rangle$

49. a)  $\pm \frac{1}{5} \langle -4, 3 \rangle$     b)  $\pm \frac{1}{5} \langle 3, 4 \rangle$

51.  $\langle 3, 0 \rangle$     53.  $\langle -\sqrt{3}, 1 \rangle$

55.  $\left(\frac{3 + \sqrt{2}}{\sqrt{2}}\right)\mathbf{i} + \left(\frac{3}{\sqrt{2}}\right)\mathbf{j}$

57.  $(2 \cos 4 + \cos 2)\mathbf{i} + (2 \sin 4 + \sin 2)\mathbf{j}$

59.  $-\frac{\sqrt{2}}{2}\mathbf{i} + \frac{\sqrt{2}}{2}\mathbf{j}$     63. 1,33, 132,5°

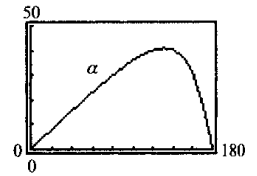
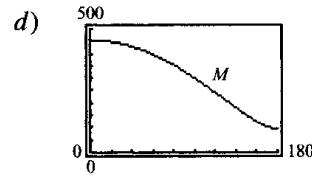
65. a)  $\theta = 0^\circ$     b)  $\theta = 180^\circ$     c) No

67. a) Dirección:  $\alpha = 11,8^\circ$   
Magnitud: 440,2 N

b)  $M = \sqrt{(275 + 180 \cos \theta)^2 + (180 \sin \theta)^2}$   
 $\alpha = \arccos\left(\frac{36 \cos \theta + 55}{\sqrt{3.960 \cos \theta + 4.321}}\right)$

c)	$\theta$	$0^\circ$	$30^\circ$	$60^\circ$	$90^\circ$
	$M$	455,0	440,2	396,9	328,7
	$\alpha$	$0^\circ$	$11,8^\circ$	$23,1^\circ$	$33,2^\circ$

$\theta$	$120^\circ$	$150^\circ$	$180^\circ$
$M$	241,9	149,3	95,0
$\alpha$	$40,1^\circ$	$37,1^\circ$	$0^\circ$



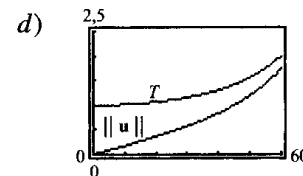
e)  $M$  decrece porque las fuerzas, al variar  $\theta$  de  $0^\circ$  a  $180^\circ$ , pasan de actuar en la misma dirección a actuar en direcciones opuestas.

69.  $71,3^\circ, 228,5$  libras    71.  $(-4, -1), (6, 5), (10, 3)$

73. a) Tensión  $\approx 1,1547$  libras    b)  $T = \sec \theta$   
 $\|\mathbf{u}\| \approx 0,5774$  libras     $\|\mathbf{u}\| = \operatorname{tg} \theta$

c)	$\theta$	$0^\circ$	$10^\circ$	$20^\circ$	$30^\circ$
	$T$	1	1,0154	1,0642	1,1547
	$\ \mathbf{u}\ $	0	0,1763	0,3640	0,5774

$\theta$	$40^\circ$	$50^\circ$	$60^\circ$
$T$	1,3054	1,5557	2
$\ \mathbf{u}\ $	0,8391	1,1918	1,7321



e) Ambas son funciones crecientes para  $0^\circ \leq \theta \leq 60^\circ$   
f)  $\lim_{\theta \rightarrow \pi/2^-} T = \infty, \lim_{\theta \rightarrow \pi/2^-} \|\mathbf{u}\| = \infty$

75. Horizontal: 1.193,43 pies/s  
Vertical: 125,43 pies/s

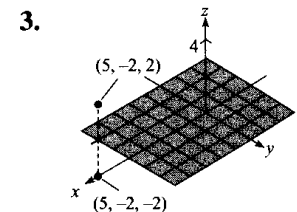
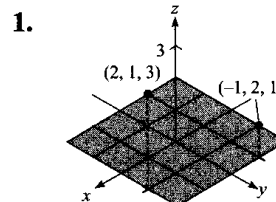
77.  $38,3^\circ$  noroeste    79.  $T_2 = 157,316$   
 $882,9$  km/h     $T_3 = 3.692,482$

84. Verdadero    85. Verdadero

86. Verdadero    87. Falso:  $a = b = 0$

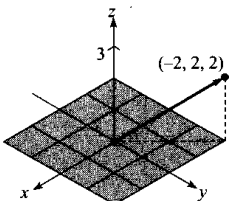
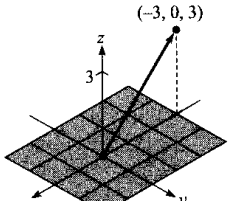
88. Falso:  $\|\mathbf{ai} + \mathbf{bj}\| = \sqrt{2}|a|$     89. Verdadero

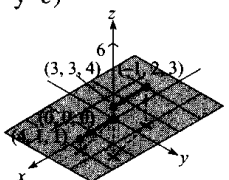
Sección 10.2 (página 988)

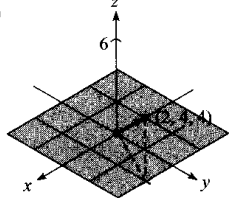
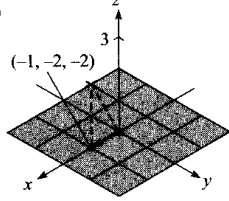


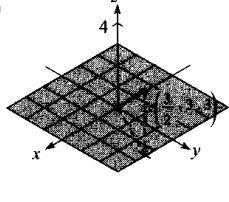
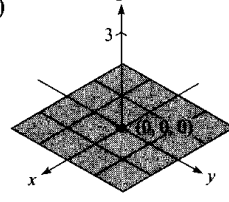
5.  $A(2, 3, 4)$   $B(-1, -2, 2)$     7.  $(-3, 4, 5)$   
 9.  $(10, 0, 0)$     11.  $0$   
 13. Tres unidades por debajo del plano  $xy$ , a la derecha del plano  $xz$  y frente al plano  $yz$ , o tres unidades bajo el plano  $xy$ , a la izquierda del plano  $xz$  y detrás del plano  $yz$ .  
 15. A la derecha del plano  $xz$  y detrás del plano  $yz$ , o a la izquierda del plano  $xz$  y frente al plano  $yz$ .

17.  $3, 3\sqrt{5}, 6$     19.  $6, 6, 2\sqrt{10}$   
 Triángulo rectángulo    Triángulo isósceles  
 21.  $(0, 0, 5), (2, 2, 6), (2, -4, 9)$     23.  $(\frac{3}{2}, -3, 5)$   
 25.  $(x - 0)^2 + (y - 2)^2 + (z - 5)^2 = 4$   
 27.  $(x - 1)^2 + (y - 3)^2 + (z - 0)^2 = 10$   
 29. Centro:  $(1, -3, -4)$     31. Centro:  $(\frac{1}{3}, -1, 0)$   
 Radio: 5    Radio: 1

33. a)  $\langle -2, 2, 2 \rangle$     35. a)  $\langle -3, 0, 3 \rangle$   
 b)     b) 

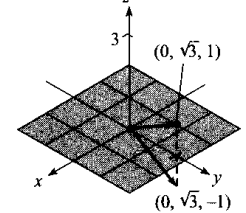
37. a) y c)     b)  $\langle 4, 1, 1 \rangle$

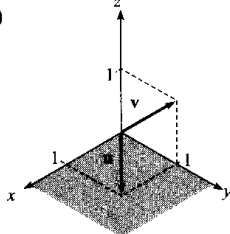
41. a)     39.  $(3, 1, 8)$   
 b) 

- c)     d) 

43.  $\langle -1, 0, 4 \rangle$     45.  $\langle 6, 12, 6 \rangle$   
 47.  $\langle \frac{7}{2}, 3, \frac{5}{2} \rangle$     49. a y b  
 51. a    53. Colineales  
 55. No colineales    59. 0  
 61.  $\sqrt{14}$     63.  $\sqrt{34}$

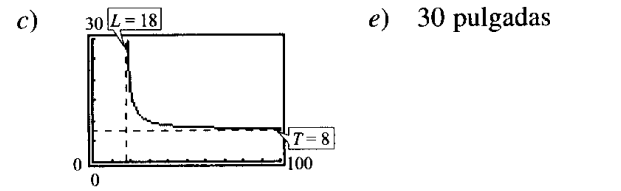
65. a)  $\frac{1}{3} \langle 2, -1, 2 \rangle$     b)  $-\frac{1}{3} \langle 2, -1, 2 \rangle$   
 67. a)  $\frac{1}{\sqrt{38}} \langle 3, 2, -5 \rangle$     b)  $-\frac{1}{\sqrt{38}} \langle 3, 2, -5 \rangle$   
 71.  $\pm \frac{5}{3}$     73.  $\langle 0, \frac{10}{\sqrt{2}}, \frac{10}{\sqrt{2}} \rangle$     75.  $\langle 1, -1, \frac{1}{2} \rangle$   
 77.  $\langle 0, \sqrt{3}, \pm 1 \rangle$     79.  $(2, -1, 2)$



81. a)     c)  $a = b = 1$

83. a)  $T = \frac{8L}{\sqrt{L^2 - 18^2}}$   
 b) 

$L$	20	25	30	35	40	45	50
$T$	18,4	11,5	10	9,3	9,0	8,7	8,6



85.  $\frac{\sqrt{3}}{3} \langle 1, 1, 1 \rangle$   
 87. Tensión en  $\overline{AB}$ : 202,919 N  
 Tensión en  $\overline{AC}$ : 157,909 N  
 Tensión en  $\overline{AD}$ : 226,521 N  
 89.  $\left(x - \frac{4}{3}\right)^2 + (y - 3)^2 + \left(z + \frac{1}{3}\right)^2 = \frac{44}{9}$

Sección 10.3 (página 1000)

1. a) -6    b) 25    c) 25    d)  $\langle -12, 18 \rangle$     e) -12  
 3. a) 2    b) 29    c) 29    d)  $\langle 0, 12, 10 \rangle$     e) 4  
 5. a) 1    b) 6    c) 6    d)  $\mathbf{i} - \mathbf{k}$     e) 2  
 7. \$17.139,05, ingresos totales

9. 20

11.  $\frac{\pi}{2}$

13.  $\arccos\left(-\frac{1}{5\sqrt{2}}\right) \approx 98,1^\circ$     15.  $\arccos\left(\frac{\sqrt{2}}{3}\right) \approx 61,9^\circ$

17.  $\arccos\left(-\frac{8\sqrt{13}}{65}\right) \approx 116,3^\circ$     21. Ni uno ni otro

23. Ortogonal    25. Ni uno ni otro    27. Ortogonal

31. a)  $\theta = \frac{\pi}{2}$     b)  $0 < \theta < \frac{\pi}{2}$     c)  $\frac{\pi}{2} < \theta < \pi$

35.  $\cos \alpha = \frac{1}{3}$

37.  $\cos \alpha = 0$

$\cos \beta = \frac{2}{3}$

$\cos \beta = \frac{3}{\sqrt{13}}$

$\cos \gamma = \frac{2}{3}$

$\cos \gamma = -\frac{2}{\sqrt{13}}$

39. Magnitud: 124,310 libras

$\alpha = 29,48^\circ$

$\beta = 61,39^\circ$

$\gamma = 96,53^\circ$

41.  $\arccos\left(\frac{1}{\sqrt{3}}\right) \approx 54,7^\circ$

43.  $\alpha = 90^\circ$

$\beta = 45^\circ$

$\gamma = 45^\circ$

45. a)  $\langle \frac{5}{2}, \frac{1}{2} \rangle$

b)  $\langle -\frac{1}{2}, \frac{5}{2} \rangle$

47. a)  $\langle 0, \frac{33}{25}, \frac{44}{25} \rangle$     b)  $\langle 2, -\frac{8}{25}, \frac{6}{25} \rangle$     51.  $\langle 0, 0 \rangle$

53. a) **u** y **v** son paralelos

b) **u** y **v** son ortogonales

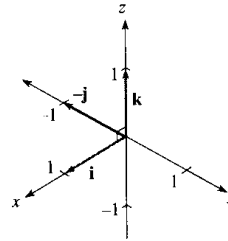
55.  $\langle 4, 3 \rangle, \langle -4, -3 \rangle$     57.  $\langle 2, 0, 3 \rangle, \langle -2, 0, -3 \rangle$

59. a) 8.282,2 libras    b) 30.909,6 libras

61. 425 libras/pie    63. 72

5.  $-\mathbf{j}$

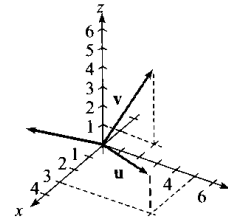
7.  $\langle -1, -1, -1 \rangle$



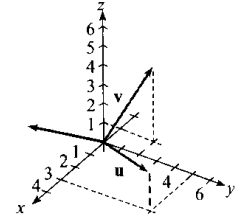
9.  $\langle 0, 0, 54 \rangle$

11.  $\langle -2, 3, -1 \rangle$

13.



15.



17.  $\left\langle -70, -23, \frac{57}{2} \right\rangle, \left\langle \frac{-140}{\sqrt{24.965}}, \frac{-46}{\sqrt{24.965}}, \frac{57}{\sqrt{24.965}} \right\rangle$

19.  $\left\langle \frac{71}{20}, -\frac{11}{5}, \frac{5}{4} \right\rangle, \left\langle \frac{-71}{\sqrt{7.602}}, \frac{-44}{\sqrt{7.602}}, \frac{25}{\sqrt{7.602}} \right\rangle$

23. 1    25.  $6\sqrt{5}$     27.  $2\sqrt{83}$

29.  $\frac{3\sqrt{13}}{2}$     31.  $\frac{9\sqrt{6}}{2}$     33. 1

35. 6    37. 2    39. 75

41.  $10 \cos 40^\circ \approx 7,60$  libras/pie

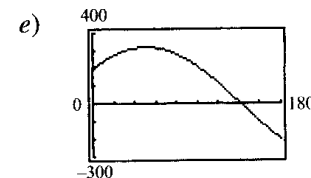
43. a)  $\vec{AB} = -\frac{5}{4} \mathbf{j} + \mathbf{k}$

$\mathbf{F} = -200(\cos \theta \mathbf{j} + \sin \theta \mathbf{k})$

b)  $25(8 \cos \theta + 10 \sin \theta)$

c)  $25(4\sqrt{3} + 5)$

d)  $\theta = 51,34^\circ$ ; los vectores son ortogonales



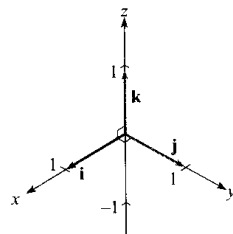
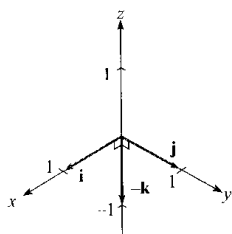
$\theta \approx 141,34^\circ, \vec{AB}$  es paralelo a **F**

55. Hallar el producto vectorial de los vectores  $\langle x_2 - x_1, y_2 - y_1, z_2 - z_1 \rangle$  y  $\langle x_3 - x_1, y_3 - y_1, z_3 - z_1 \rangle$

Sección 10.4 (página 1008)

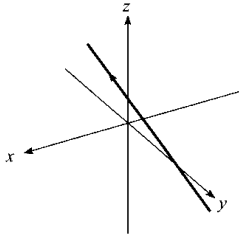
1.  $-\mathbf{k}$

3.  $\mathbf{i}$



Sección 10.5 (página 1019)

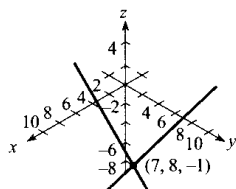
1. a)



- b)  $P = (1, 2, 2), Q = (10, -1, 17), \vec{PQ} = \langle 9, -3, 15 \rangle$   
 (Hay muchas respuestas correctas.) Las componentes del vector y los coeficientes de  $t$  son proporcionales porque la recta es paralela a  $\vec{PQ}$ .  
 c)  $(-\frac{1}{5}, \frac{1}{5}, 0), (7, 0, 12), (0, \frac{7}{3}, \frac{1}{3})$

<u>Ecuaciones paramétricas</u>	<u>Ecuaciones simétricas</u>	<u>Números de dirección</u>
--------------------------------	------------------------------	-----------------------------

- |   |  |             |
|---|--|-------------|
| 3. $x = t$<br>$y = 2t$<br>$z = 3t$                  | $x = \frac{y}{2} = \frac{z}{3}$                      | 1, 2, 3     |
| 5. $x = -2 + 2t$<br>$y = 4t$<br>$z = 3 - 2t$        | $\frac{x+2}{2} = \frac{y}{4} = \frac{z-3}{-2}$       | 2, 4, -2    |
| 7. $x = 1 + 3t$<br>$y = -2t$<br>$z = 1 + t$         | $\frac{x-1}{3} = \frac{y}{-2} = \frac{z-1}{1}$       | 3, -2, 1    |
| 9. $x = 5 + 17t$<br>$y = -3 - 11t$<br>$z = -2 - 9t$ | $\frac{x-5}{17} = \frac{y+3}{-11} = \frac{z+2}{-9}$  | 17, -11, -9 |
| 11. $x = 2$<br>$y = 3$<br>$z = 4 + t$               |  |             |
| 13. a, b  | 15. $(2, 3, 1), \cos \theta = \frac{7\sqrt{17}}{51}$ |             |
| 17. No hay intersección                             | 19. $(7, 8, -1)$                                     |             |



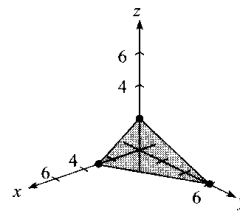
21. a)  $P = (0, 0, -1), Q = (0, -2, 0), R = (3, 4, -1)$   
 $\vec{PQ} = \langle 0, -2, 1 \rangle, \vec{PR} = \langle 3, 4, 0 \rangle$

b)  $\vec{PQ} \times \vec{PR} = \langle -4, 3, 6 \rangle$

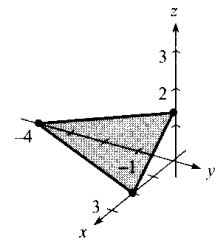
Las componentes del producto vectorial son proporcionales a los coeficientes de las variables en la ecuación. El producto vectorial es paralelo al vector normal.

- |                         |                        |
|-------------------------|------------------------|
| 23. $x - 2 = 0$         | 25. $2x + 3y - z = 10$ |
| 27. $x - y + 2z = 12$   | 29. $3x + 9y - 7z = 0$ |
| 31. $4x - 3y + 4z = 10$ | 33. $z = 3$            |
| 35. $x + y + z = 5$     | 37. $7x + y - 11z = 5$ |
| 39. $y - z = -1$        | 41. Ortogonal          |
| 43. $83.5^\circ$        | 45. Paralelos          |

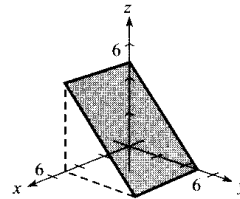
47.



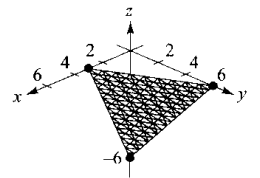
49.



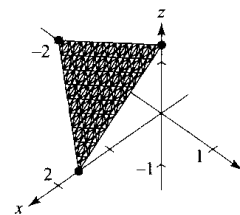
51.



53.



55.



57.  $x = 2$   
 $y = 1 + t$   
 $z = 1 + 2t$

59.  $(2, -3, 2)$

61. No hay intersección

63.  $\frac{6\sqrt{14}}{7}$

65.  $\frac{2\sqrt{26}}{13}$

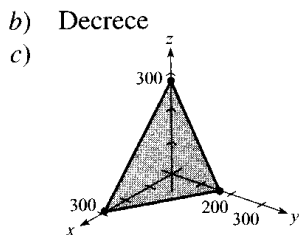
67.  $149 \frac{\sqrt{17}}{17} \approx 36,14$

69. a)

<b>Año</b>	1970	1975	1980	1985
<b>z (aprox.)</b>	213,6	173,7	144,7	121,1

<b>Año</b>	1990	1991	1992	1993
<b>z (aprox.)</b>	85,3	81,9	81,4	83,6



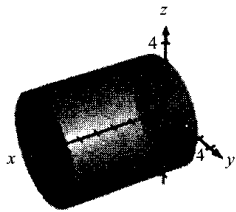
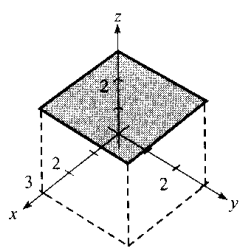
71. a) Esfera  
 $x^2 + y^2 + z^2 - 6x + 4y - 10z + 22 = 0$

b) Planos  
 $4x - 3y + z = 10 \pm 4\sqrt{26}$

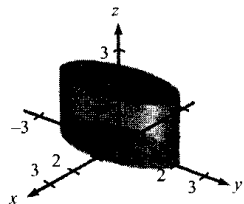
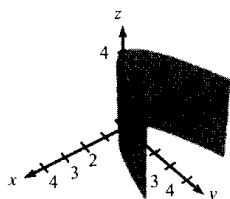
73.  $\arccos \frac{1}{65} \approx 89,1^\circ$       75. Verdadero  
76. Falso: pueden no cortarse (véase Ejercicio 61).

Sección 10.6 (página 1031)

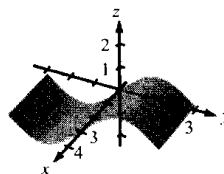
1. c    2. e    3. f    4. b    5. d    6. a  
7. Plano                      9. Cilindro circular recto



11. Cilindro parabólico      13. Cilindro elíptico

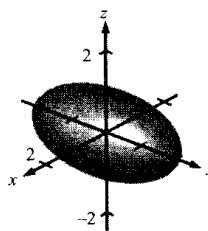


15. Cilindro

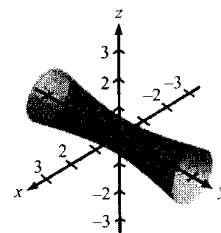


17. a) (20, 0, 0)  
b) (10, 10, 20)  
c) (0, 0, 20)  
d) (0, 20, 0)

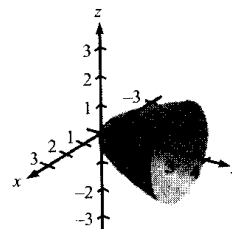
19. Elipsoide



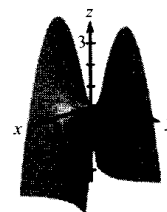
21. Hiperboloide de una hoja



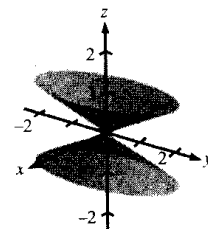
23. Paraboloide elíptico



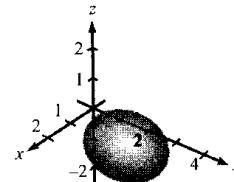
25. Paraboloide hiperbólico



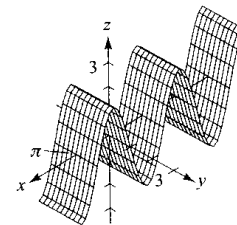
27. Cono elíptico



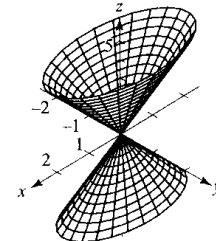
29. Elipsoide



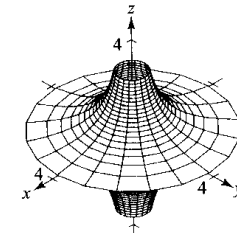
- 31.



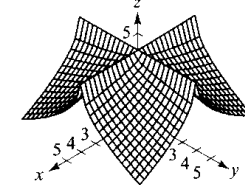
- 33.

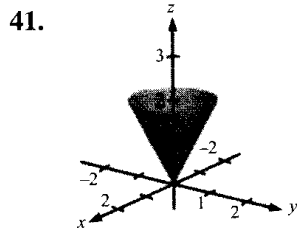
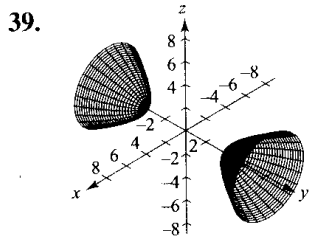


- 35.



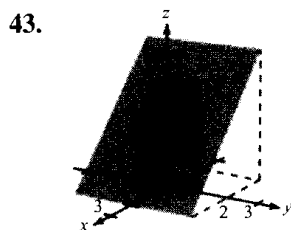
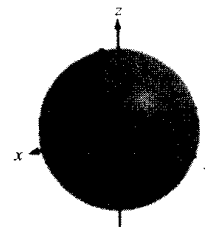
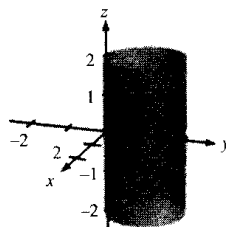
- 37.





17.  $x^2 + y^2 - 2y = 0$

19.  $x^2 + y^2 + z^2 = 4$



45.  $x^2 + z^2 = 4y$

21.  $(4, 0, \frac{\pi}{2})$

23.  $(4\sqrt{2}, \frac{2\pi}{3}, \frac{\pi}{4})$

25.  $(4, \frac{\pi}{6}, \frac{\pi}{6})$

27.  $(\sqrt{6}, \sqrt{2}, 2\sqrt{2})$

29.  $(0, 0, 12)$

31.  $(\frac{5}{2}, \frac{5}{2}, -\frac{5\sqrt{2}}{2})$

47.  $4x^2 + 4y^2 = z^2$

49.  $y^2 + z^2 = \frac{4}{x^2}$

33. b)  $(5, 385, -0, 927, 1, 190)$

51.  $y = \sqrt{2z}$

53.  $\frac{128\pi}{3}$

35.  $x^2 + y^2 + z^2 = 4$

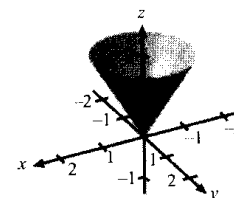
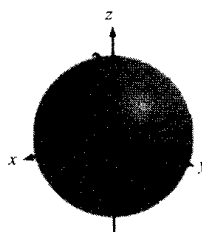
37.  $3x^2 + 3y^2 - z^2 = 0$

55. a) Eje mayor:  $4\sqrt{2}$   
Eje menor: 4  
Focos:  $(0, \pm 2, 2)$

b) Eje mayor:  $8\sqrt{2}$   
Eje menor: 8  
Focos:  $(0, \pm 4, 8)$

57.  $\frac{x^2}{3.963^2} + \frac{y^2}{3.963^2} + \frac{z^2}{3.942^2} = 1$

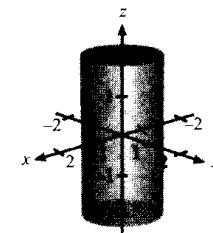
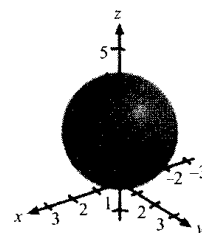
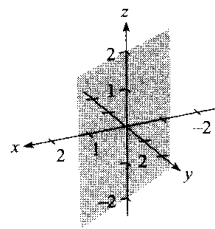
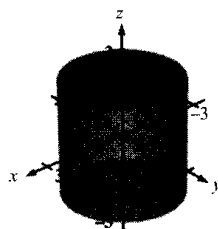
59.  $x = at, y = -bt, z = 0;$   
 $x = at, y = bt + ab^2, z = 2abt + a^2b^2$



39.  $x^2 + y^2 + (z - 2)^2 = 4$     41.  $x^2 + y^2 = 1$

Sección 10.7 (página 1039)

1.  $(5, \frac{\pi}{2}, 1)$     3.  $(2, \frac{\pi}{3}, 4)$     5.  $(2\sqrt{2}, -\frac{\pi}{4}, -4)$   
7.  $(5, 0, 2)$     9.  $(1, \sqrt{3}, 2)$     11.  $(-2\sqrt{3}, -2, 3)$   
13.  $x^2 + y^2 = 4$     15.  $x - \sqrt{3}y = 0$



43.  $(4, \frac{\pi}{4}, \frac{\pi}{2})$     45.  $(2\sqrt{13}, -\frac{\pi}{6}, \arccos[\frac{3}{\sqrt{13}}])$   
47.  $(13, \pi, \arccos[\frac{5}{13}])$     49.  $(10, \frac{\pi}{6}, 0)$   
51.  $(3\sqrt{3}, -\frac{\pi}{6}, 3)$     53.  $(4, \frac{7\pi}{6}, 4\sqrt{3})$

Rectangulares

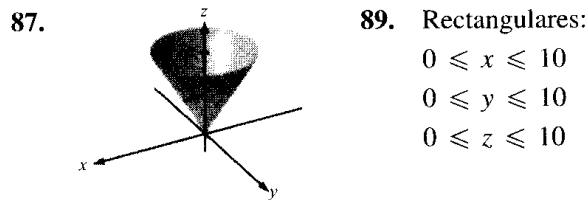
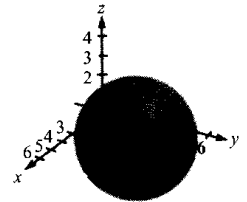
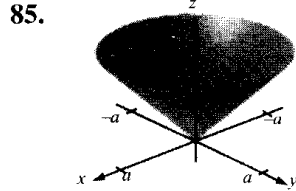
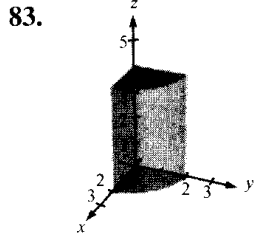
Cilíndricas

Esféricas

- |  |                           |                                       |
|--|---------------------------|---------------------------------------|
| 55. (4, 6, 3)                                  | (7,211, 0,983, 3)         | (7,810, 0,983, 1,177)                 |
| 57. (4,698, 1,710, 8)                          | $(5, \frac{\pi}{9}, 8)$   | (9,434, 0,349, 0,559)                 |
| 59. (-7,071, 12,247, 14,142)                   | (14,142, 2,094, 14,142)   | $(20, \frac{2\pi}{3}, \frac{\pi}{4})$ |
| 61. (3, -2, 2)                                 | (3,606, -0,588, 2)        | (4,123, -0,588, 1,064)                |
| 63. $(\frac{5}{2}, \frac{4}{3}, -\frac{3}{2})$ | (2,833, 0,490, -1,5)      | (3,206, 0,490, 2,058)                 |
| 65. (-3,536, 3,536, -5)                        | $(5, \frac{3\pi}{4}, -5)$ | (7,071, 2,356, 2,356)                 |
| 67. (2,804, -2,095, 6)                         | (-3,5, 2,5, 6)            | (6,946, 5,641, 0,528)                 |

69. d    70. e    71. c    72. a    73. f    74. b

75. a)  $r^2 + z^2 = 16$       b)  $\rho = 4$
77. a)  $r^2 + (z - 1)^2 = 1$     b)  $\rho = 2 \cos \phi$
79. a)  $r = 4 \sin \theta$     b)  $\rho = \frac{4 \sin \theta}{\sin \phi} = 4 \sin \theta \operatorname{cosec} \phi$
81. a)  $r^2 = \frac{9}{\cos^2 \theta - \sin^2 \theta}$     b)  $\rho^2 = \frac{9 \operatorname{cosec}^2 \phi}{\cos^2 \theta - \sin^2 \theta}$



89. Rectangulares:  
 $0 \leq x \leq 10$   
 $0 \leq y \leq 10$   
 $0 \leq z \leq 10$

91. Esféricas:  $4 \leq \rho \leq 6$     93. Elipse

5. Sobre el plano  $xy$  y a la derecha del plano  $xz$  o bajo el plano  $xy$  y a la izquierda del plano  $xz$ .
7.  $(x - 3)^2 + (y + 2)^2 + (z - 6)^2 = \frac{225}{4}$
9. Centro: (2, 3, 0)  
Radio: 3

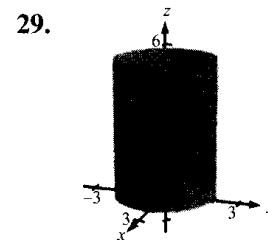
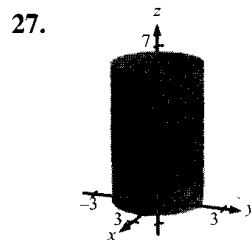
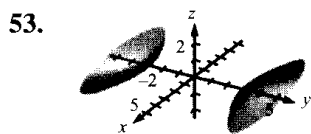
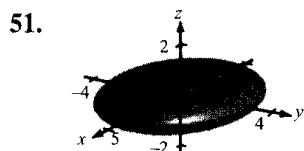
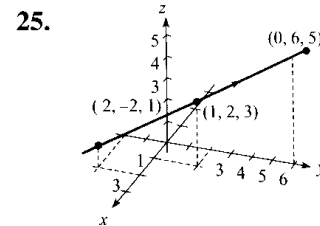
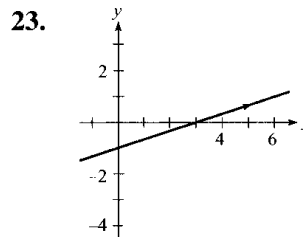
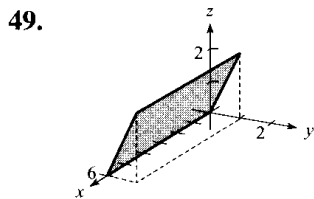
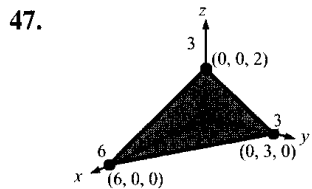
11. a)  $\mathbf{u} = -\mathbf{i} + 4\mathbf{j}$       b) 3  
 $\mathbf{v} = -3\mathbf{i} + 6\mathbf{k}$       c)  $24\mathbf{i} + 6\mathbf{j} + 12\mathbf{k}$
- d)  $4x + y + 2z = 20$     e)  $x = 4 - t, y = 4 + 4t, z = 0$
13. Ortogonales      15.  $\theta = \arccos\left(\frac{\sqrt{2} + \sqrt{6}}{4}\right) = 15^\circ$
17.  $\pi$       19.  $-2\sqrt{2}\mathbf{i} + 2\sqrt{2}\mathbf{j}$
21.  $\frac{3}{\sqrt{26}}\mathbf{i} - \frac{9}{\sqrt{26}}\mathbf{j} + \frac{12}{\sqrt{26}}\mathbf{k}$       23.  $\sqrt{14}$
27.  $\langle -\frac{15}{14}, \frac{5}{7}, -\frac{5}{14} \rangle$       31. 4
33. Tensión en  $\overline{AB}$ : 21,7 N  
Tensión en  $\overline{BC}$ : 17,7 N

Ejercicios de repaso del Capítulo 10 (página 1041)

1. a)  $\mathbf{u} = 3\mathbf{i} - \mathbf{j}$   
 $\mathbf{v} = 4\mathbf{i} + 2\mathbf{j}$   
 b)  $2\sqrt{5}$     c) 10    d)  $10\mathbf{i}$     e)  $2\mathbf{i} + \mathbf{j}$     f)  $\mathbf{i} - 2\mathbf{j}$
3. (-5, 4, 0)

35.  $100 \sec 20^\circ \approx 106,4$  libras
37. a)  $x = 1, y = 2 + t, z = 3$     b) No hay
39. a)  $x = t, y = -1 + t, z = 1$     b)  $x = y + 1, z = 1$
41.  $x + 2y = 1$       43.  $\frac{8}{7}$       45.  $\frac{\sqrt{3}}{3}$



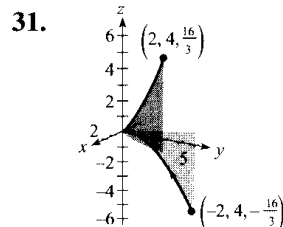


$$\frac{x^2}{16} + \frac{y^2}{9} + z^2 = 1$$

55. a)  $x^2 + y^2 - 2z + 2 = 0$   
 b)  $4\pi \approx 12,6 \text{ cm}^3$   
 c)  $\frac{225\pi}{64} \approx 11,0 \text{ cm}^3$

57. a)  $\left(4, \frac{3\pi}{4}, 2\right)$       b)  $\left(2\sqrt{5}, \frac{3\pi}{4}, \arccos\left[\frac{\sqrt{5}}{5}\right]\right)$

59. a)  $r^2 \cos 2\theta = 2z$       b)  $\rho = 2 \sec 2\theta \cos \phi \operatorname{cosec}^2 \phi$



## CAPÍTULO 11

Sección 11.1 (página 1052)

1.  $(-\infty, 0) \cup (0, \infty)$       3.  $(0, \infty)$   
 5.  $[0, \infty)$       7.  $(-\infty, \infty)$   
 9. a)  $\frac{1}{2} \mathbf{i}$       b)  $\mathbf{j}$   
 c)  $\frac{1}{2}(s+1)^2 \mathbf{i} - s \mathbf{j}$       d)  $\frac{1}{2} \Delta t(\Delta t + 4) \mathbf{i} - \Delta t \mathbf{j}$

11. a)  $\ln 2 \mathbf{i} + \frac{1}{2} \mathbf{j} + 6 \mathbf{k}$       b) No es posible

c)  $\ln(t-4) \mathbf{i} + \frac{1}{t-4} \mathbf{j} + 3(t-4) \mathbf{k}$

d)  $\ln(1+\Delta t) \mathbf{i} - \frac{\Delta t}{1+\Delta t} \mathbf{j} + 3\Delta t \mathbf{k}$

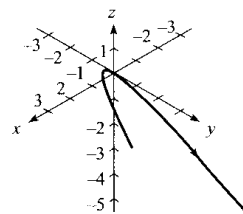
13.  $\sqrt{1+t^2}$

15.  $t^2(5t-1)$  El producto escalar es un número (un escalar)

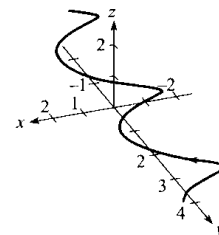
17. b      18. c      19. d      20. a

21. a)  $(-20, 0, 0)$       b)  $(10, 20, 10)$   
 c)  $(0, 0, 20)$       d)  $(20, 0, 0)$

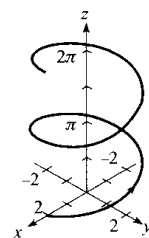
33. Parábola



35. Hélice



37.



a) La hélice se traslada dos unidades hacia atrás por el eje  $x$

