

第 8 章 習題簡答

習題 8-1

1. (1) $\overline{PQ} = 2\sqrt{6}$, 中點 : $(0, 0, 4)$ (2) $\overline{PQ} = \sqrt{26}$, 中點 : $(-\frac{3}{2}, \frac{3}{2}, 2)$
 2. $P(2\sqrt{3}, 2\sqrt{3}, 2\sqrt{3})$ 或 $P(-2\sqrt{3}, -2\sqrt{3}, -2\sqrt{3})$
 3. 略 4. $P(-\frac{7}{3}, -\frac{1}{3}, 3)$ 5. $C(2, 0, 9)$

習題 8-2

1. (1) $\langle -11, 2, 24 \rangle$ (2) -20 (3) $\langle 54, 39, -6 \rangle$
 (4) $\langle -23, -38, -28 \rangle$ (5) $\langle -35, -80, -10 \rangle$ (6) 15
 2. 略 3. $\frac{1}{2}\sqrt{1178}$

習題 8-3

1.
$$\begin{cases} x = -1 + 2t \\ y = -2 - 4t, t \in \mathfrak{R} \\ z = 3 + t \end{cases}$$
2. 參數式 :
$$\begin{cases} x = 3 - t \\ y = -1 + 4t, t \in \mathfrak{R} \\ z = 2 - 7t \end{cases}$$
 , 對稱式 : $\frac{x-3}{-1} = \frac{y+1}{4} = \frac{z-2}{-7}$
3. $(2, -2, -1)$
4. $\frac{\pi}{2} + \cos^{-1} \frac{4}{21}$, $\frac{\pi}{2} - \cos^{-1} \frac{4}{21}$
5.
$$\begin{cases} x = 1 - \frac{21}{29}t \\ y = -2 + \frac{162}{29}t, t \in \mathfrak{R} \\ z = 5 - \frac{132}{29}t \end{cases}$$
6. $5x - y + z + 5 = 0$
 7. $2x - y + 4z - 24 = 0$
 8. $3x - 2y - 7z = 0$
 9. $12x + 4y - 3z + 26 = 0$ 或 $12x + 4y - 3z = 0$
 10. $x - y - 2z = 8$

習題 8-4

1. $(x-2)^2 + (y-1)^2 + z^2 = 19$ 2. $x^2 + y^2 + z^2 - x - y - z = 0$
 3. $x^2 + (y-3)^2 + z^2 = 25$ 或 $x^2 + (y+7)^2 + z^2 = 25$
 4. $x^2 + y^2 + (z - \frac{13}{10})^2 = \frac{2669}{100}$

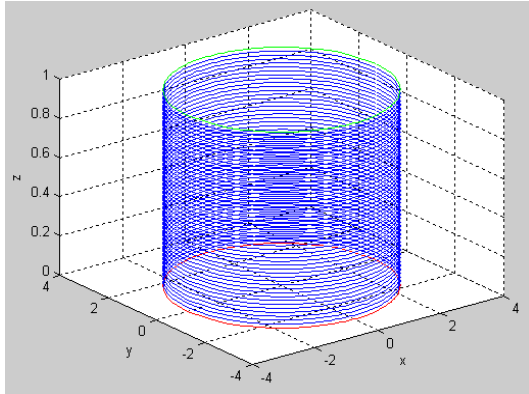
5. $(x-1)^2 + (y+1)^2 + (z-2)^2 = \frac{32}{3}$

6. 無解

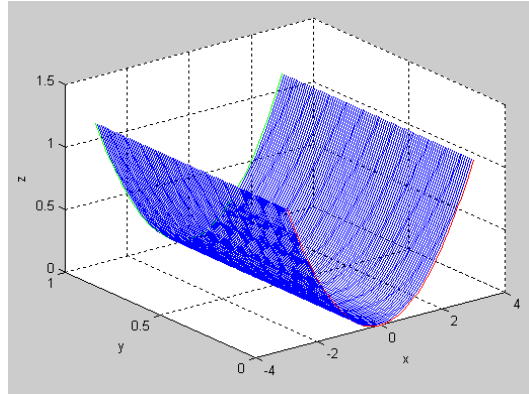
7. $r = \frac{\sqrt{210}}{6}$, 切點: $(\frac{5}{6}, -\frac{4}{3}, \frac{11}{6})$

8. $\frac{275}{9}\pi$

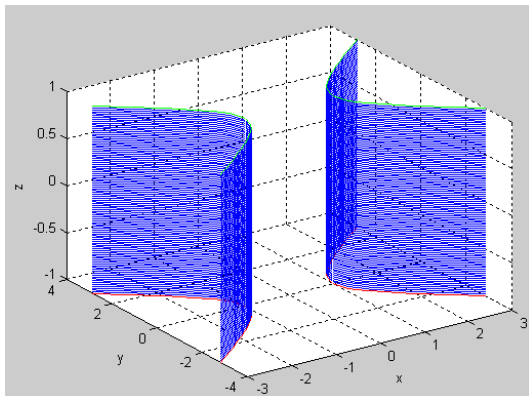
9. (1) $x^2 + y^2 = 9$



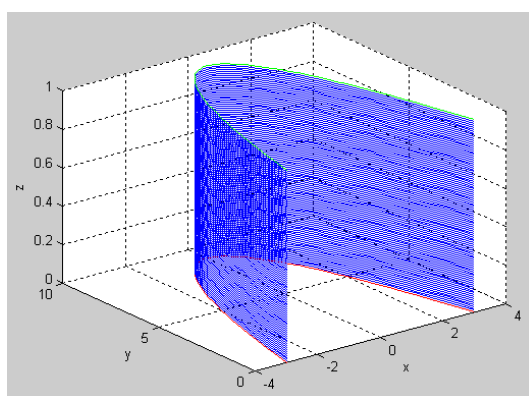
(2) $x^2 = 8z$



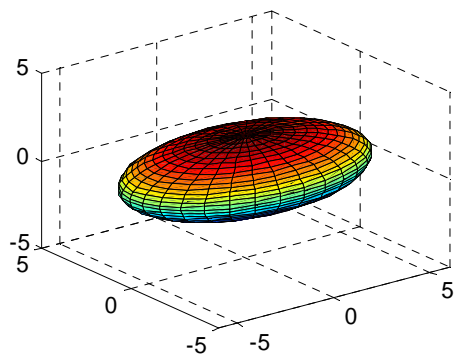
(3) $x^2 - y^2 = 1$



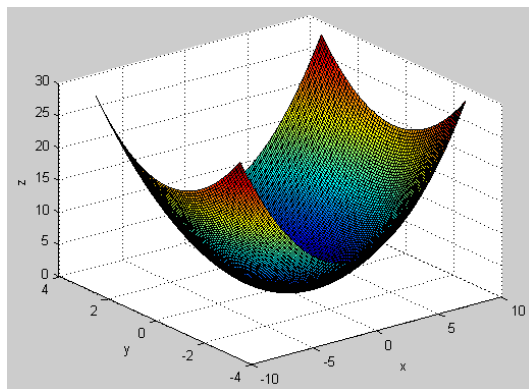
(4) $y = 9 - x^2$



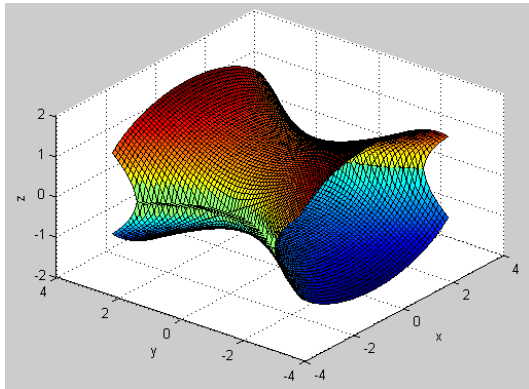
10. (1) 橢圓面: $\frac{x^2}{6^2} + \frac{y^2}{3^2} + \frac{z^2}{2^2} = 1$



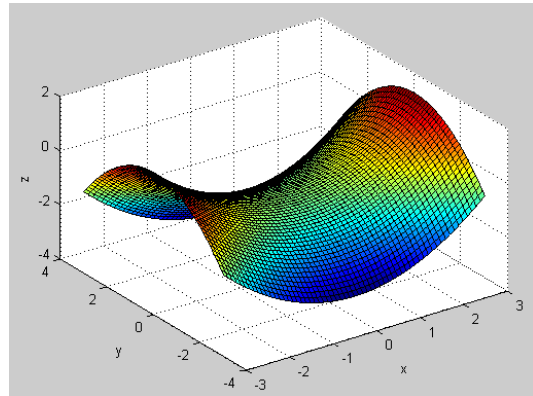
(2) 橢圓拋物面: $\frac{x^2}{2^2} + \frac{y^2}{1^2} = z$



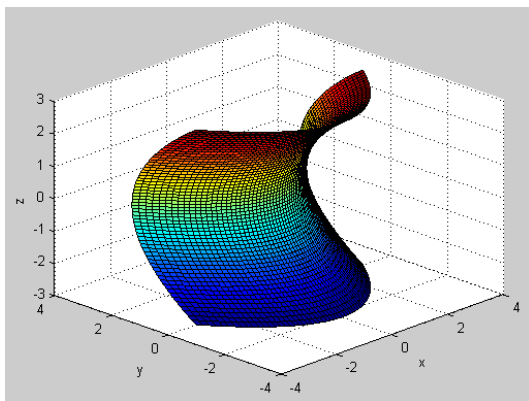
(3) 單葉雙曲面： $\frac{x^2}{2^2} - \frac{y^2}{2^2} + \frac{z^2}{1^2} = 1$



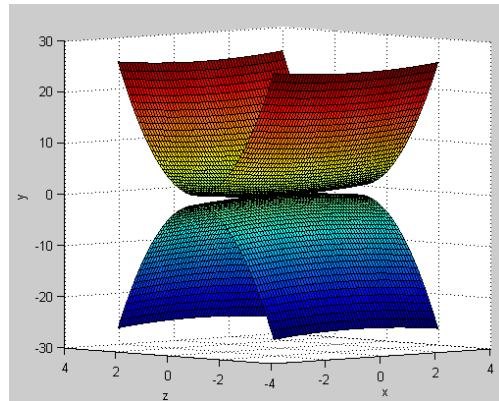
(4) 雙曲拋物面： $\frac{x^2}{2^2} - \frac{y^2}{2^2} = z + 1$



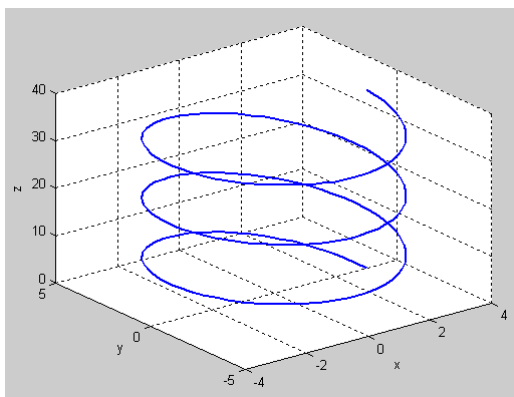
(5) 雙曲拋物面： $\frac{x^2}{2^2} - \frac{z^2}{2^2} = y$



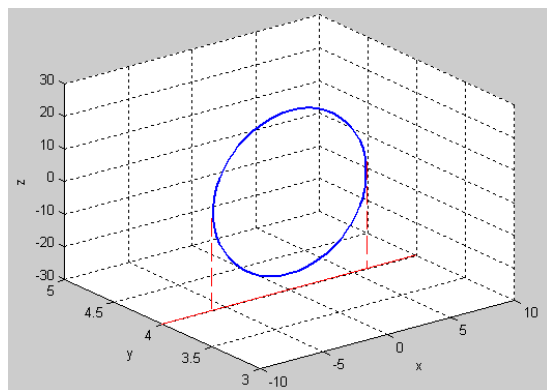
(6) 橢圓錐面： $x^2 - 9y^2 + 25z^2 = 0$



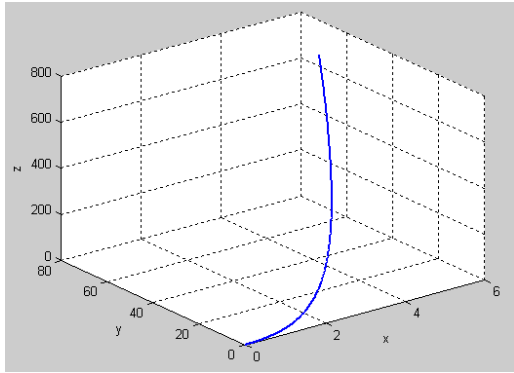
11.(1) $x = 3 \cos t, y = 5 \sin t, z = 2t, t \geq 0$



(2) $x = 6 \sin t, y = 4, z = 25 \cos t, t \geq 0$



(3) $x = t, y = 2t^2, z = 3t^3, t \geq 0$



習題 8-5

1.(1)柱面座標： $(2\sqrt{5}, \tan^{-1} \frac{1}{2}, -4)$ ，球面座標： $(6, \pi - \cos^{-1} \frac{2}{3}, \tan^{-1} \frac{1}{2})$

(2)柱面座標： $(2, \frac{5\pi}{3}, 4)$ ，球面座標： $(2\sqrt{5}, \cos^{-1} \frac{2}{\sqrt{5}}, \frac{5\pi}{3})$

(3)柱面座標： $(\sqrt{2}, \frac{\pi}{4}, 1)$ ，球面座標： $(\sqrt{3}, \cos^{-1} \frac{\sqrt{3}}{3}, \frac{\pi}{4})$

(4)柱面座標： $(2, \frac{\pi}{3}, 4)$ ，球面座標： $(2\sqrt{5}, \cos^{-1} \frac{2}{\sqrt{5}}, \frac{\pi}{3})$

2. $(0, 10, 4)$

3. $(1, 1, \sqrt{2})$

4. $(2\sqrt{10}, \cos^{-1} \frac{3}{\sqrt{10}}, \frac{2\pi}{3})$

5.(1) $r^2(1 + \sin 2\theta) = z - 5$ (2) $r^2(\frac{\cos^2 \theta}{a^2} + \frac{\sin^2 \theta}{b^2}) = 1$

6. (1) $\rho = 2$ (2) $\rho = a \sin \varphi \cos \theta + b \sin \varphi \sin \theta + c \cos \varphi$

7. (1) $x^2 + y^2 + z^2 = ay$ (2) $z^2 - x^2 - y^2 = a^2$

習題 8-6

1.(1) $\langle -\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}, -1 \rangle$ (2) $\langle 2e, 6, \frac{1}{3} \rangle$

2.(1) $\langle \frac{1}{4}, \frac{5}{8}, e-1 \rangle$ (2) $\langle \frac{1}{2}(e-1), \frac{2}{3}, -\frac{2}{3} \rangle$

3.略

4.略