MAC2313 Review 1 Answer

1. (1) $\sqrt{6}$ (2) -1 (3) $\langle -3, -7, -5\rangle$ (4) 18 (5) $\arccos\left(-\dfrac{1}{2\sqrt{21}}\right)$

   (6) $-\dfrac{1}{\sqrt{6}}$ (7) $-\dfrac{1}{6}\langle 1, 1, -2\rangle$ (8) $\sqrt{83}$ (9) 18

2. (1) $5\sqrt{5}$N (2) $\arctan\left(\dfrac{2-\sqrt{3}}{1+2\sqrt{3}}\right)$

3. $\langle 1, -10, 0\rangle$

4. -18

5. $\vec{v}_{//} = -\dfrac{3}{2}\langle -2, 1, -1\rangle$ and $\vec{v}_{\perp} = \dfrac{1}{2}\langle 0, 1, 1\rangle$

6. (1) C; B (2) $x^2 + (y-1)^2 + (z-4)^2 = 11$ (3) $\dfrac{1}{\sqrt{6}}\langle 1, 1, -2\rangle$ or $-\dfrac{1}{\sqrt{6}}\langle 1, 1, -2\rangle$

   (4) $x + y - 2z + 7 = 0$ (5) $\sqrt{6}$

7. Yes; No

8. Yes; $(4, -3, 5)$

9. (1) No; No (They are skew lines.) (2) $\sqrt{24/29}$

10. (1) Yes (2) $\theta = \arccos(1/3)$

    (3) $\dfrac{x-3}{-2} = \dfrac{z}{-2}$; $y = -2$ (The answer is not unique.) (4) $\dfrac{2}{\sqrt{3}}$

11. The traces in the vertical planes $x = k$ are two lines when $k = 0$ and hyperbolas when $k \neq 0$; the traces in the vertical planes $y = k$ are ellipses; the traces in the horizontal planes $z = k$ are two lines when $k = 0$ and hyperbolas when $k \neq 0$; $x^2 + 4z^2 = (y+1)^2$: Cone

12. $y^2 = 2x + 1$; parabolic cylinder

13. (1) $\hat{T}(t) = \dfrac{1}{\sqrt{2}}\langle -\sin t, 1, -\cos t\rangle$; $\hat{N}(t) = \langle -\cos t, 0, \sin t\rangle$

    (2) $y = -z$, $x = 1$ (3) $2\sqrt{2}\pi$ (4) $\sqrt{2}$ (5) $\dfrac{1}{2}$

14. $\dfrac{12}{17^{3/2}}$

15. $a_T = -2$; $a_N = 4$

16. (1) $\hat{T}(t) = \dfrac{1}{\sqrt{13}}\langle 3\sin t, -3\cos t, 2\rangle$ (2) $\hat{N}(t) = \langle \cos t, \sin t, 0\rangle$

(3) $\hat{B}(t) = \dfrac{1}{\sqrt{13}}\langle -2\sin t, 2\cos t, 3\rangle$ (4) $\dfrac{3}{13\sin t\cos t}$

17. (1) $(0, 5]$ (2) $\langle 0, 0, \sqrt{5}\rangle$ (3) $\left\langle \dfrac{t^2}{2}\ln(t) - \dfrac{t^2}{4}, -\dfrac{\cos(\pi t)}{\pi}, -\dfrac{2}{3}(5-t)^{3/2} \right\rangle + \vec{C}$

(4) $a = -4$ and $b = 4\pi$