HW 23 Solutions MAT 17B

7. Length $= \sqrt{1^2 + 3^2} = \sqrt{10}$

8. Length $= \sqrt{(-2)^2 + 7^2} = \sqrt{53}$

9. Length $= \sqrt{0^2 + 1^2 + 5^2} = \sqrt{26}$

10. Length $= \sqrt{(-2)^2 + 1^2 + (-3)^2} = \sqrt{14}$

15. $(1)(3) + (2)(-1) = \boxed{1}$

16. $(-1)(-3) + (2)(-4) = \boxed{-5}$

17. $(0)(-3) + (-1)(1) + (3)(1) = \boxed{2}$

18. $(2)(3) + (-3)(1) + (1)(-2) = \boxed{1}$

19. Length $= \sqrt{\vec{\Sigma} \cdot \vec{\Sigma}}$

$= \sqrt{(0)(0) + (-1)(-1) + (2)(2)} = \boxed{\sqrt{5}}$

20. Length $= \sqrt{\vec{\Sigma} \cdot \vec{\Sigma}} = \sqrt{(-1)(-1) + (4)(4) + (3)(3)} = \boxed{\sqrt{26}}$

21. Length $= \sqrt{\vec{\Sigma} \cdot \vec{\Sigma}} = \sqrt{(1)(1) + (2)(2) + (3)(3) + (4)(4)}$

$= \boxed{\sqrt{30}}$

22. Length $= \sqrt{\vec{\Sigma} \cdot \vec{\Sigma}} = \sqrt{(-1)(-1) + (-2)(-2) + (-3)(-3) + (-4)(-4)} = \boxed{\sqrt{30}}$

23. If angle is θ, then

$$\cos\theta = \frac{x \cdot y}{(\text{Length of } x)(\text{Length of } y)} = \frac{x \cdot y}{\sqrt{x \cdot x}\sqrt{y \cdot y}}$$

$$= \frac{(1)(3) + (2)(-1)}{\sqrt{1^2 + 2^2}\ \sqrt{3^2 + (-1)^2}}$$

$$= \frac{1}{\sqrt{5}\sqrt{10}} = \frac{1}{\sqrt{50}}$$

$$\therefore \quad \theta = \arccos\left(\frac{1}{\sqrt{50}}\right) = \cos^{-1}\left(\frac{1}{\sqrt{50}}\right)$$

24. $$\cos\theta = \frac{x \cdot y}{\sqrt{x \cdot x}\ \sqrt{y \cdot y}} = \frac{(-1)(-2) + (2)(-4)}{\sqrt{(-1)^2 + 2^2}\ \sqrt{(-2)^2 + (-4)^2}}$$

$$= \frac{-6}{\sqrt{5}\ \sqrt{20}}$$

$$= \frac{-6}{\sqrt{100}} = \frac{-6}{10} =$$

$$\theta = \arccos\left(\frac{-6}{10}\right) = \cos^{-1}\left(\frac{-6}{10}\right)$$

25. $\cos\theta = \dfrac{x \cdot y}{\sqrt{x \cdot x}\ \sqrt{y \cdot y}}$

$= \dfrac{(0)(-3) + (-1)(1) + (3)(1)}{\sqrt{0^2 + (-1)^2 + 3^2}\ \sqrt{(-3)^2 + 1^2 + 1^2}}$

$= \dfrac{2}{\sqrt{10}\ \sqrt{11}} = \dfrac{2}{\sqrt{110}}$

$\theta = \arccos\left(\dfrac{2}{\sqrt{110}}\right) = \cos^{-1}\left(\dfrac{2}{\sqrt{110}}\right)$

26. $\cos\theta = \dfrac{x \cdot y}{\sqrt{x \cdot x}\ \sqrt{y \cdot y}}$

$= \dfrac{(1)(3) + (-3)(1) + (2)(-4)}{\sqrt{1^2 + (-3)^2 + 2^2}\ \sqrt{3^2 + 1^2 + (-4)^2}}$

$= \dfrac{-8}{\sqrt{14}\ \sqrt{26}}$

$\theta = \arccos\left(\dfrac{8}{\sqrt{14}\ \sqrt{26}}\right) = \cos^{-1}\left(\dfrac{8}{\sqrt{14}\ \sqrt{26}}\right)$