1. **C.**	$m=-\left(-\frac{3}{7}\right)=\frac{3}{7},\ \perp m=-\frac{7}{3},\ 7x+3y=-15, A+B+C=25$
2. **C.**	$\sin^2\alpha-\sin^2\beta=\frac{(\sqrt{2}+\sqrt{6})(\sqrt{2}-\sqrt{6})}{16}=-\frac{1}{4};\quad -\frac{1}{4}=\sin^2\alpha-\frac{3}{4}$ $\pm\frac{\sqrt{2}}{2}=\sin\alpha \qquad \alpha=\frac{\pi}{4} \qquad \alpha\neq-\frac{\pi}{4};\sin\left(-\frac{\pi}{4}+\frac{\pi}{3}\right)\neq\frac{\sqrt{2}+\sqrt{6}}{4}$
3. **B.**	$\begin{vmatrix}3 & -1 & -3 & -6 & 8\\ 2 & 5 & 2 & 1 & -4\end{vmatrix}$ $\quad 15-2-3+24+2+15+12-8=55$ $A=\frac{1}{2}(55)=27.5$
4. **D.**	
5. **C.**	Pt. of intersection $\left(\frac{14}{11},-\frac{6}{11}\right);\ \left\lvert\frac{4\left(\frac{14}{11}\right)-5\left(-\frac{6}{11}\right)+3}{\sqrt{41}}\right\rvert=1.7$
6. **D.**	$R=\frac{a}{2\sin A};\quad D=2\left(\frac{12}{2\sin 37°}\right)=19.9$
7. **C.**	$\tan\theta=\frac{\left(-\frac{7}{8}\right)-\left(\frac{4}{3}\right)}{(1)+\left(-\frac{7}{8}\right)\left(\frac{4}{3}\right)}=13.25;\qquad \tan^{-1}(\theta)=13.25;\quad \theta=85.7°$
8. **C.**	
9. **A.**	$\sin 4\alpha=\frac{\sqrt{3}}{2};\ 4\alpha=\frac{2\pi}{3};\quad \alpha=\frac{\pi}{6};\quad \cos 4\alpha=-\frac{1}{2};\ \alpha=\frac{\pi}{6}$
10. **C.**	$b+c=12\left(\frac{\cos\left(\frac{(63-37)}{2}\right)}{\sin\left(\frac{80}{2}\right)}\right)=18.2$; Law of Sines could also be used.
11. **A.**	$s=\frac{1}{2}(a+b+c)=13;\quad r=\sqrt{\frac{(s-a)(s-b)(s-c)}{s}}=1.6$
12. **C.**	$2\cosh^2 u-1=\frac{1+\tanh^2 u}{1-\tanh^2 u};\quad 161(1-\tanh^2 u)=1+\tanh^2 u;$ $161-161(\tanh^2 u)=1+\tanh^2 u;\ 160=162\tanh^2 u;\ 0.99=\tanh^2 u$
13. **C.**	$\frac{13}{\sin 67°}=\frac{12}{\sin\theta};\quad \theta=58.2°$
14. **C.**	$\frac{1-\cos^2(\alpha)}{\sec(\alpha)\csc(\beta)}=\sin^2(\alpha)\cos(\alpha)\sin(\beta)$
15. **C.**	$n^2=2+\sqrt{1+n};n^2-2=\sqrt{1+n};n^4-4n^2+4=1+n;\quad n^4-4n^2+4=1+n;n^4-4n^2-n+3=0$
16. **C.**	$a^2=13^2+5^2-2(13)(5)\cos(86°);\quad a=13.6$
17. **B.**	$s=20;r=2\sqrt{2};\quad \tan\left(\frac{A}{2}\right)=\frac{r}{s-a}=\frac{2\sqrt{2}}{8}=\frac{\sqrt{2}}{4}$

18. **B.** $\dfrac{2(\cosh^2(u)-\sinh^2(u))\tanh(u)\cosh(u)\coth(u)\sinh(u)\operatorname{csch}(u)}{\operatorname{csch}(u)\tanh(u)\coth(u)} = 2\cosh(u)\sinh(u)$

$2\cosh(u)\sinh(u) = \sinh(2u)$

19. **D.** $A = \dfrac{(18)\left(\sqrt{194}\right)\sin(62°)}{2} = 110.7$

20. **B.**

21. **D.** $A = \dfrac{1}{2}(9)(15)(\sin 30°) = 33.8$

22. **C.** $r = 2; \tan^{-1}\left(\dfrac{1}{\sqrt{3}}\right) = 30°$; $(2\text{cis}30°)^{10} = 2^{10}[\cos 300° + i\sin 300°] = 1024\left(\dfrac{1}{2} - \dfrac{\sqrt{3}}{2}\right) = 512\left(1 - i\sqrt{3}\right)$

23. **B.** $x = r\cos\theta$; $y = r\sin\theta$; $r - 4r\cos\theta = 2$; $\pm\sqrt{x^2+y^2} - 4x = 2$; $x^2 + y^2 = (2+4x)^2$;

$x^2 + y^2 = 4 + 16x + 16x^2$; $15x^2 - y^2 + 16x + 4 = 0$

24. **B.** $hm^2 + (a-b)m - h = 0; \theta = \tan^{-1}(m)$; $4m^2 + 0 - 4 = 0; m = \pm 1$;-1 extraneous ; $\tan^{-1}(1) = 45°$

25. **A.** $d = \sqrt{3^2 + 9^2 - 2(3)(9)\cos(354°)} = 6.0$

26. **D.**

$\vec{\mathbf{F}}_{\mathbf{R}} = 50\hat{\mathbf{i}} - 40\hat{\mathbf{j}} + 180\hat{\mathbf{k}}$; $\left|\vec{\mathbf{F}}_{\mathbf{R}}\right| = 191.05$; $\vec{\mathbf{u}}_{F_R} = \dfrac{\vec{\mathbf{F}}_{\mathbf{R}}}{\left|\vec{\mathbf{F}}_{\mathbf{R}}\right|} = 0.262\hat{\mathbf{i}} - 0.209\hat{\mathbf{j}} + 0.942\hat{\mathbf{k}}$

$\cos\alpha = 0.262; \cos\beta = -.0209; \cos\gamma = 0.942$; $\alpha = 74.8°; \beta = 102.1°; \gamma = 19.6°$;

$74.8° + 102.1° + 19.6° = 196.5°$

Let $\vec{\mathbf{u}}_1 = (k,0,0); \vec{\mathbf{u}}_2 = (0,k,0); \vec{\mathbf{u}}_3 = (0,0,k)$; diagonal $\vec{\mathbf{d}} = (\mathbf{k},\mathbf{k},\mathbf{k})$;

27. **A.** $\cos\theta = \dfrac{\vec{\mathbf{u}}_1 \cdot \vec{\mathbf{d}}}{\|\vec{\mathbf{u}}_1\|\|\vec{\mathbf{d}}\|} = \dfrac{k^2}{(k)\left(\sqrt{3k^2}\right)} = \dfrac{1}{\sqrt{3}}$ $\qquad \theta = \cos^{-1}\left(\dfrac{1}{\sqrt{3}}\right) = 54.7°$

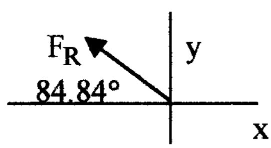
28. **D.** $\vec{\mathbf{u}} \times (\vec{\mathbf{v}} \times \vec{\mathbf{w}}) = (\vec{\mathbf{u}} \cdot \vec{\mathbf{w}})\vec{\mathbf{v}} - (\vec{\mathbf{u}} \cdot \vec{\mathbf{v}})\vec{\mathbf{w}}$; $\left(6\hat{\mathbf{i}} + 18\hat{\mathbf{j}} + 24\hat{\mathbf{k}}\right) - \left(\hat{\mathbf{i}} - 9\hat{\mathbf{j}} + 18\hat{\mathbf{k}}\right) = 5\hat{\mathbf{i}} + 27\hat{\mathbf{j}} + 6\hat{\mathbf{k}}$

29. **B.**

Force	X-Component	Y-Component
F_1	0	-150
F_2	115.91	-31.06
F_3	180	240
F_4	-120	207.84
F_5	-200	0
F_R	-24.09	266.78

$\left|\vec{\mathbf{F}}_{\mathbf{R}}\right| = 267.87$; $\theta = \tan^{-1}\left(\dfrac{266.78}{24.09}\right) = 84.84°$;

lies in 2nd Quadrant = 95.16



30. **A.** $V = \left|\vec{\mathbf{u}} \cdot (\vec{\mathbf{v}} \times \vec{\mathbf{w}})\right|$; $(\vec{\mathbf{v}} \times \vec{\mathbf{w}}) = \begin{vmatrix} \hat{\mathbf{i}} & \hat{\mathbf{j}} & \hat{\mathbf{k}} & \hat{\mathbf{i}} & \hat{\mathbf{j}} \\ 0 & 4 & -2 & 0 & 4 \\ 2 & 2 & -4 & 2 & 2 \end{vmatrix} = -12\hat{\mathbf{i}} - 4\hat{\mathbf{j}} - 8\hat{\mathbf{k}}$

$\left|\left(2\hat{\mathbf{i}} - 6\hat{\mathbf{j}} + 2\hat{\mathbf{k}}\right) \cdot \left(-12\hat{\mathbf{i}} - 4\hat{\mathbf{j}} - 8\hat{\mathbf{k}}\right)\right| = 16$