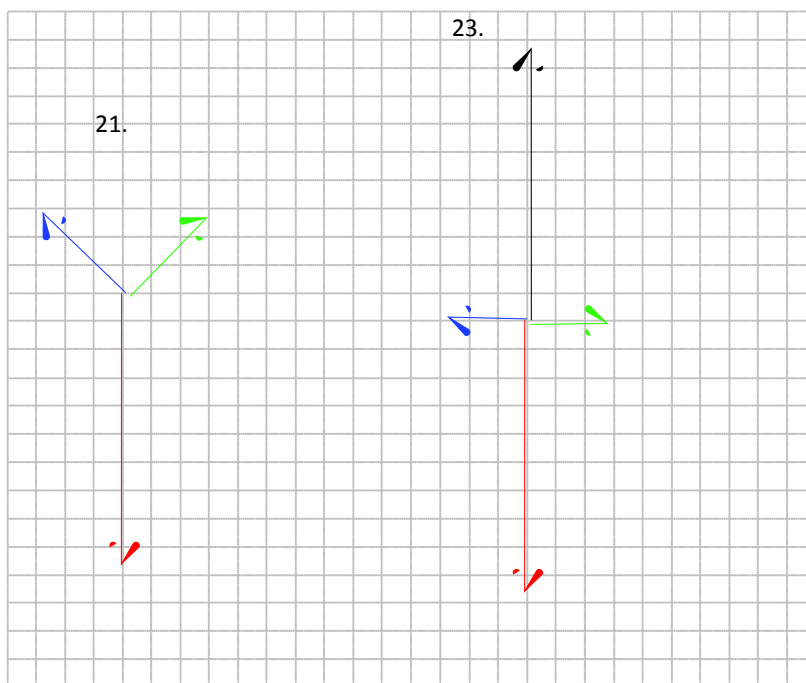


1. Section 1-1

($\mathbf{u} + \mathbf{v}$ only in 11-19)

- | | |
|--|--|
| 1. $\overrightarrow{P_1P_2} = \langle 1, 2 \rangle = \mathbf{i} + 2\mathbf{j}$ | 11. $\mathbf{u} + \mathbf{v} = \langle 5, 6 \rangle$ |
| 3. $\overrightarrow{P_1P_2} = \langle -4, -2, -2 \rangle = -4\mathbf{i} - 2\mathbf{j} - 2\mathbf{k}$ | 13. $\mathbf{u} + \mathbf{v} = \langle -4, 3 \rangle$ |
| 5. $\overrightarrow{P_1P_2} = \langle 1, 10, 4 \rangle = \mathbf{i} + 10\mathbf{j} + 4\mathbf{k}$ | 15. $\mathbf{u} + \mathbf{v} = \langle 0, 0 \rangle$ |
| 7. $\overrightarrow{P_1P_2} = \langle -7, 20, 4 \rangle = -7\mathbf{i} + 20\mathbf{j} + 4\mathbf{k}$ | 17. $\mathbf{u} + \mathbf{v} = \langle 1, 1, 0 \rangle$ |
| 9. $\overrightarrow{P_1P_2} = \langle 1, 2, 3 \rangle = \mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$ | 19. $\mathbf{u} + \mathbf{v} = \langle 2, 4, 5 \rangle$ |
| 21. $\mathbf{F}_{net} = \langle 0, -3.8 \rangle$, <i>no</i> | 23. $\mathbf{F}_{net} = \langle 0, 0 \rangle$, <i>yes</i> |
| 25. $\mathbf{F}_{net} = \langle 10, 10, 10.2 \rangle$, <i>no</i> | |



2. Section 1-2

- $\|\mathbf{u}\| = 5, \|\mathbf{v}\| = 2, \theta = 36.869^\circ$
- $\|\mathbf{u}\| = 5.009, \|\mathbf{v}\| = 9.214, \theta = 23.839^\circ$
- $\|\mathbf{u}\| = 10, \|\mathbf{v}\| = 10, \theta = 90^\circ$
- $\|\mathbf{u}\| = 3, \|\mathbf{v}\| = 6.324, \theta = 42.45^\circ$
- $\|\mathbf{u}\| = 1, \|\mathbf{v}\| = 1, \theta = 90^\circ$
- $k = -12$
- $k = 2$
- $k = -3$ or $k = 2$
- $k = 1.104$
- $\cos(\alpha) = \frac{1}{2}, \alpha = \frac{\pi}{3}$
- $\cos(\alpha) = \cos(\beta) = \frac{1}{2}, \alpha = \beta = \frac{\pi}{3}$
 $\cos(\gamma) = \frac{1}{\sqrt{2}}, \gamma = \frac{\pi}{4}$
- $\cos(\alpha) = \cos(\gamma) = \frac{1}{\sqrt{2}}, \alpha = \gamma = \frac{\pi}{4}$
 $\cos(\beta) = 0, \beta = \frac{\pi}{2}$
- $\text{proj}_{\mathbf{p}}(\mathbf{v}) = \langle 1.58, 11.06 \rangle$
- $\text{proj}_{\mathbf{p}}(\mathbf{v}) = \langle \frac{13}{6}, \frac{13}{3}, \frac{13}{6} \rangle$
- $\text{proj}_{\mathbf{p}}(\mathbf{v}) = -3\mathbf{j}$

3. Section 1-3

- $\mathbf{u} \times \mathbf{v} = \langle 0, 0, -1 \rangle$
- $\mathbf{u} \times \mathbf{v} = \langle 0, 0, -6 \rangle$
- $\mathbf{u} \times \mathbf{v} = \langle 0, 0, 1 \rangle$
- $\mathbf{u} \times \mathbf{v} = \langle -6, 39, -15 \rangle$
- $\mathbf{u} \times \mathbf{v} = \langle 0, 0, 0 \rangle$
- $\text{Area} = 3/2$
- $\text{Area} = 2$
- $\text{Area} = \frac{\sqrt{3}}{2}$
- $\text{Area} = \frac{3}{2}\sqrt{2}$
- $\text{Volume} = 12$
- $\text{Volume} = 4$
- $\text{Volume} = 5$
- $\text{Volume} = lwh$

4. Section 1-4

- $\mathbf{L}(t) = \langle t, 7 - 5t \rangle$
- $\mathbf{L}(t) = \langle -4t + 7, -2t + 9, -2t + 2 \rangle$
- $\mathbf{L}(t) = \langle t - 4, 20t - 17, 4t + 1 \rangle$
- $\mathbf{L}(t) = \langle -te + \pi, t\pi + e, -2t + 2 \rangle$
- $z = \frac{1}{3}x + \frac{1}{3}y$
- $z = -\frac{7}{2}x - \frac{11}{4}y + \frac{55}{4}$
- $z = 0$
- $y = x$
- $z = 2x + 3$
- $y = \frac{3}{2}x$
- $z = 0$
- $z = \frac{1}{2}x + y$

5. Section 1-5

Equation only: No sketches.

1. $y = x + 2$
3. $y^3 = x^2$
5. $y = x - 1 + 2\sqrt{x - 1}$
7. $x^2 + y^2 = 4$
9. $\frac{x^2}{4} + \frac{y^2}{9} = 1$
11. $y = 2x^2 - 1$
13. $\frac{(x-1)^2}{4} + y^2 = 1$
15. $(x - 1)^2 + (y - 2)^2 = 1$
17. $x - 1 + \frac{(y-2)^2}{9} = 1$
19. $3y = 4x^2 - 2$
21. $(x - 1)^2 + y^2 = 1$
23. $x + y = 1$
25. $\mathbf{r}(\theta) = \langle 3 \cos(\theta) + 1, 3 \sin(\theta) + 1 \rangle$
27. $\mathbf{r}(\theta) = \langle 5 \cos(\theta) + 1, 5 \sin(\theta) - 3 \rangle$
29. $\mathbf{r}(t) = \langle 3 \cos(5t) + 1, 3 \sin(5t) + 1 \rangle$

6. Section 1-6

1. $\mathbf{v}(t) = \langle 2t, 3t^2, 4t^3 \rangle$, $\mathbf{a}(t) = \langle 2, 6t, 12t^2 \rangle$
3. $\mathbf{v}(t) = \langle -\frac{1}{t^2}, -\frac{2}{t^3}, -\frac{3}{2t^{5/2}} \rangle$, $\mathbf{a}(t) = \langle \frac{2}{t^3}, \frac{6}{t^4}, \frac{15}{4t^{7/2}} \rangle$
5. $\mathbf{v}(t) = \langle -3 \sin t, 5 \cos t, -4 \sin t \rangle$, $\mathbf{a}(t) = \langle -3 \cos t, -5 \sin t, -4 \cos t \rangle$
7. $\mathbf{v}(t) = \langle [\sec^2 t, -\csc^2 t, \sec(t) - \csc t \cot t] \rangle$, $\mathbf{a}(t) = \langle [2 \tan t \sec^2 t, -2 \cot t \csc^2 t, \csc t \cot^2 t + \sec t] \rangle$
9. $\mathbf{v}(t) = \langle 0, 0, \tan t \rangle$, $\mathbf{a}(t) = \langle 0, 0, \sec^2(t) \rangle$,
11. $\mathbf{v}(t) = \left\langle 2t, \frac{1}{1+t^2} \right\rangle$, $\mathbf{a}(t) = \left\langle 2, -\frac{2t}{(1+t^2)^2} \right\rangle$
13. $\mathbf{v}(t) = \langle -e^{-t} \sin t + e^{-t} \cos t, -e^{-t} \cos t - e^{-t} \sin t, -e^{-t}t + e^{-t} \rangle$, $\mathbf{a}(t) = \langle -2e^{-t} \cos t, 2e^{-t} \sin t, e^{-t}t - e^{-t} \rangle$

Velocity only: No sketch.

15. $\mathbf{v}(1) = \langle 2, 4 \rangle$
17. $\mathbf{v}\left(\frac{\pi}{6}\right) = \left\langle -\frac{1}{2}, \frac{1}{2}\sqrt{3} \right\rangle$
19. $\mathbf{v}(0) = \langle 1, -1 \rangle$
21. $\mathbf{v}(2) = \langle 3, 2 \rangle$

23. $\mathbf{r}(t) = \langle t, 2t, 64t - 16t^2 \rangle$
 plane: $y = 2x$
 $t_{\max} = 2$
25. $\mathbf{r}(t) = \langle 1 + 72t, 3 + 38t, 65t - 16t^2 \rangle$
 plane: $\frac{89}{36} + \frac{19}{36}x = y$
 $t_{\max} = 2.03125$
27. $\mathbf{r}(t) = \langle 0, 0, -16t^2 \rangle$
 plane: undefined
 $t_{\max} = 0$
29. $\mathbf{r}(t) = \langle 72t, 38t, 65t - 16t^2 \rangle$
 plane: $72y = -32x$
 $t_{\max} = 2.03125$

7. Section 1-7

1. $\mathbf{v} \cdot \mathbf{v} + \mathbf{r} \cdot \mathbf{a}$ 2. $\frac{d}{dt}(r)$
 3. $k^2 \mathbf{r} \cdot \mathbf{v} + m \mathbf{v} \cdot \mathbf{a}$ 4. $\frac{d}{dt}(\mathbf{r} \cdot (\mathbf{v} \times \mathbf{L}))$
 5. $\mathbf{a} \times \mathbf{L} - k\mathbf{v}$ $\frac{d}{dt}(\mathbf{v} \times \mathbf{L} - \frac{k}{r}\mathbf{r})$
7. $\mathbf{T}(t) = \langle \frac{3}{5}, \frac{4}{5} \rangle, v = 5$
9. $\mathbf{T}(t) = \left[\frac{2t^2}{2t^2 + 1}, \frac{2t}{2t^2 + 1}, \frac{1}{2t^2 + 1} \right], v = 2t + t^{-1}$
11. $\mathbf{T}(t) = \langle \frac{3}{5} \cos(t^2), \frac{4}{5} \cos(t^2), -\sin(t^2) \rangle, v = 10t^2$
13. $\mathbf{T}(t) = \left\langle \frac{2e^{2t}}{2e^{2t} + 1}, \frac{2e^t}{2e^{2t} + 1}, \frac{1}{2e^{2t} + 1} \right\rangle, v = 2e^{2t} + 1$
15. $L = 2\pi$
 17. $L = 2\pi$
 19. $L = 2\pi$
 21. $L = \frac{15}{4}$
 23. $L = \frac{20}{27}\sqrt{10} - \frac{2}{27}$
25. $s(t) = t^3$
 27. $s(t) = 5t^2$
 29. $s(t) = e^{2t} + t - 1$

8. Section 1-8

1. $\mathbf{N} = \langle -\cos(2t), -\sin(2t) \rangle, \kappa(t) = 1$
3. $\mathbf{N} = \langle \frac{-4}{5}, \frac{3}{5} \rangle, \kappa(t) = 0$
5. $\mathbf{N} = \langle -\cos(t), -\sin(t), 0 \rangle, \kappa(t) = \frac{3}{25}$
7. $\mathbf{N} = \langle \frac{2t}{2t^2+1}, \frac{2t^2-1}{2t^2+1}, \frac{-2t}{2t^2+1} \rangle, \kappa(t) = \frac{2t}{(2t^2+1)^2}$
9. $\mathbf{N} = \langle \frac{-3}{5} \sin(t^2), \frac{-4}{5} \sin(t^2), -\cos(t^2) \rangle, \kappa(t) = \frac{1}{5}$
11. $\frac{dv}{dt} = 0, \kappa(t) = 1$
13. $\frac{dv}{dt} = 0, \kappa(t) = \frac{3}{20} \sqrt{\frac{1}{t(1-t)}}$
15. $\frac{dv}{dt} = 0, \kappa(t) = \frac{1}{90} \sqrt{\frac{81t^4 - 810t^3 - 90}{4t^2 - 40t}}$
17. $\frac{dv}{dt} = 0, \kappa(t) = \frac{5}{50} = \frac{1}{10}$
19. $\frac{dv}{dt} = \sinh(t),$
 $\kappa(t) = \sqrt{2} \operatorname{sech}^2(t)$
21. $\frac{dv}{dt} = 4e^{2t}, \kappa(t) = \frac{2e^t}{(2e^t+1)^2}$
23. $\mathbf{B} = \langle \frac{1}{\sqrt{2}}, \frac{-1}{\sqrt{2}}, 0 \rangle, \tau = 0$
25. $\mathbf{B} = \langle \frac{4}{5} \cos(t), -\frac{4}{5} \sin(t), \frac{-3}{5} \rangle$
 $\tau = \frac{-4}{25}$
27. $\mathbf{B} = \langle \frac{4}{5}, 0, \frac{-3}{5} \rangle, \tau = 0$