Answer Key

Problem 1 (Vector Equation)

- Find the Vector equation for a line that has:
- Slope $\frac{2}{3}$ and passes the point $(1, -5)$

Work

- $\vec{v} = \langle 3, 2 \rangle$
- $\vec{r_0} = \langle 1, -5 \rangle$
- $\vec{r_0} + t\vec{v} = \langle 1, -5 \rangle + t\langle 3, 2 \rangle$
- $\vec{r_0} + t\vec{v} = \langle 1 + 3t, -5 + 2t \rangle$
  $x = 1 + 3t$ and $y = -5 + 2t$

Our final answer will be: $\boxed{\vec{r_0} + t\vec{v} = \langle 1 + 3t, -5 + 2t \rangle \quad | \quad x = 1 + 3t \text{ and } y = -5 + 2t}$

Problem 2 (Vector Equation)

- Find the Vector equation for a line that has:
- Slope 4 and passes the point $(-2, 3)$

Work

- $\vec{v} = \langle 1, 4 \rangle$
- $\vec{r_0} = \langle -2, 3 \rangle$
- $\vec{r_0} + t\vec{v} = \langle -2, 3 \rangle + t\langle 1, 4 \rangle$
- $\vec{r_0} + t\vec{v} = \langle -2 + t, 3 + 4t \rangle$
  $x = -2 + t$ and $y = 3 + 4t$

Our final answer will be: $\boxed{\vec{r_0} + t\vec{v} = \langle -2 + t, 3 + 4t \rangle \quad | \quad x = -2 + t \text{ and } y = 3 + 4t}$

Problem 3 (Vector Equation)

- Find the Vector equation for a line that has:
- $(-4, 2)$ and $(2, 6)$

Work

- $m = \dfrac{6-2}{2-(-4)} = \dfrac{4}{2+4} = \dfrac{4}{6} = \dfrac{2}{3}$

- $\vec{v} = \langle 3, 2 \rangle$
- $\vec{r_0} = \langle 2, 6 \rangle$
- $\vec{r_0} + t\vec{v} = \langle 2, 6 \rangle + t\langle 3, 2 \rangle$
- $\vec{r_0} + t\vec{v} = \langle 2 + 3t, 6 + 2t \rangle$
  $x = 2 + 3t$ and $y = 6 + 2t$

Our final answer will be: $\boxed{\vec{r_0} + t\vec{v} = \langle 2 + 3t, 6 + 2t \rangle \quad | \quad x = 2 + 3t \text{ and } y = 6 + 2t}$

Problem 1 Find the length of vector $\overrightarrow{AB}$

Point A: $(2, -5)$ and Point B $(3, 4)$

Work

- $\overrightarrow{AB} = \langle 3 - 2, 4 - (-5) \rangle$
- $\overrightarrow{AB} = \langle 3 - 2, 4 + 5 \rangle$
- $\overrightarrow{AB} = \langle 1, 9 \rangle$
- $\overrightarrow{AB} = \sqrt{(1)^2 + (9)^2} = \sqrt{1 + 81} = \sqrt{82} \approx 9.055$

Our final answer will be: $\boxed{\overrightarrow{AB} = \sqrt{82} \approx 9.055}$

Problem 2 Find the length of vector $\overrightarrow{AB}$

Point A: $(0, 0)$ and Point B $(2, 5)$

Work

- $\overrightarrow{AB} = \langle 2 - 0, 5 - 0 \rangle$
- $\overrightarrow{AB} = \langle 2, 5 \rangle$
- $\overrightarrow{AB} = \sqrt{(2)^2 + (5)^2} = \sqrt{4 + 25} = \sqrt{29} \approx 5.385$

Our final answer will be: $\boxed{\overrightarrow{AB} = \sqrt{29} \approx 5.385}$

Rewriting parametric equations as Cartesian
Answer key

1. Eliminate the parameter and write as a Cartesian equation solved for y.

   $x(t) = 2t - 2$
   $y(t) = -4 + t$

   $y = \frac{1}{2}x - 3$

2. Eliminate the parameter and write as a Cartesian equation solved for y.

   $x(t) = 2t - 4$
   $y(t) = 1 + 2t$

   $y = x + 5$

3. Eliminate the parameter and write as a Cartesian equation solved for y.

   $x(t) = -5t - 3$
   $y(t) = 4 - 5t$

   $y = x + 7$

4. Eliminate the parameter and write as a Cartesian equation solved for y.

   $x(t) = -4t - 2$
   $y(t) = -4 - 2t$

   $y = \frac{1}{2}x - 3$

Answer Key

Problem 1 (Dot Product)

- Given: $a = \langle 3, 5 \rangle$ and $b = \langle -2, 4 \rangle$
- Question: Find the dot product of $\vec{a} \cdot \vec{b}$

Work

- $\vec{a} \cdot \vec{b} = (3)(-2) + (5)(4)$
- $\vec{a} \cdot \vec{b} = -6 + 20 = 14$

Our final answer will be: $\boxed{14}$

Problem 2 (Angle between vector)

- Given: $a = \langle 3, 5 \rangle$ and $b = \langle -2, 4 \rangle$
- Question: Find the angle between vector a and b

Work

- $\cos\theta = \dfrac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|}$
- $\cos\theta = \dfrac{14}{\sqrt{(3)^2 + (5)^2} \cdot \sqrt{(-2)^2 + (4)^2}}$
- $\cos\theta = \dfrac{14}{\sqrt{9 + 25} \cdot \sqrt{4 + 16}}$
- $\cos\theta = \dfrac{14}{\sqrt{34} \cdot \sqrt{20}}$
- $\cos\theta = \dfrac{14}{\sqrt{34} \cdot \sqrt{4 \cdot 5}}$
- $\cos\theta = \dfrac{14}{\sqrt{34} \cdot 2\sqrt{5}}$
- $\cos\theta = \dfrac{7}{\sqrt{34} \cdot \sqrt{5}}$
- $\cos\theta = \dfrac{7}{\sqrt{170}}$
- $\cos\theta = \dfrac{7}{\sqrt{170}} \cdot \dfrac{\sqrt{170}}{\sqrt{170}} = \dfrac{7\sqrt{170}}{170}$
- $\cos^{-1}\left(\dfrac{7\sqrt{170}}{170}\right) \approx 57.53°$

Our final answer will be: $\boxed{\approx 57.53°}$

Problem 3 (Dot Product)

- Given: $a = \langle -4, 7 \rangle$ and $b = \langle 1, -2 \rangle$
- Question: Find the dot product of $\vec{a} \cdot \vec{b}$

Work

- $\vec{a} \cdot \vec{b} = (-4)(1) + (7)(-2)$
- $\vec{a} \cdot \vec{b} = -4 - 14 = -18$

Our final answer will be: $\boxed{-18}$

Problem 4 (Angle between vector)

- Given: $a = \langle -4, 7 \rangle$ and $b = \langle 1, -2 \rangle$
- Question: Find the angle between vector a and b

Work

- $\cos\theta = \dfrac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|}$
- $\cos\theta = \dfrac{-18}{\sqrt{(-4)^2 + (7)^2} \cdot \sqrt{(1)^2 + (-2)^2}}$
- $\cos\theta = \dfrac{-18}{\sqrt{16 + 49} \cdot \sqrt{1 + 4}}$
- $\cos\theta = \dfrac{-18}{\sqrt{65} \cdot \sqrt{5}}$
- $\cos\theta = \dfrac{-18}{\sqrt{325}}$
- $\cos\theta = \dfrac{-18}{\sqrt{25 \cdot 13}}$
- $\cos\theta = \dfrac{-18}{5\sqrt{13}}$
- $\cos\theta = \dfrac{-18}{5\sqrt{13}} \cdot \dfrac{\sqrt{13}}{\sqrt{13}}$
- $\cos\theta = \dfrac{-18\sqrt{13}}{5 \cdot 13}$
- $\cos\theta = \dfrac{-18\sqrt{13}}{65}$
- $\theta = \cos^{-1}\left(\dfrac{-18\sqrt{13}}{65}\right) \approx 176.82°$

Our final answer will be: $\boxed{\approx 176.82°}$

Heavy bag problem - 425ft/lbs

	Questions	Answers
1	Find the Dot Product of the Vectors. $\mathbf{u} = \langle -3, 0 \rangle$ $\mathbf{v} = \langle -4, -3 \rangle$	12
2	Find the Dot Product of the Vectors. $\mathbf{u} = \langle 5, -2 \rangle$ $\mathbf{v} = \langle -2, 9 \rangle$	-28
3	Find the Dot Product of the Vectors. $\mathbf{u} = 8\mathbf{i}$ $\mathbf{v} = 9\mathbf{j}$	0
4	Find the Angle Between the Vectors. $\mathbf{u} = -9\mathbf{i} - 2\mathbf{j}$ $\mathbf{v} = 3\mathbf{i} - 4\mathbf{j}$	$114.34°$
5	Find the Angle Between the Vectors. $\mathbf{u} = \langle -7, 7 \rangle$ $\mathbf{v} = \langle -6, -8 \rangle$	$98.13°$
6	Find the Angle Between the Vectors. $\mathbf{u} = \langle 9, -4 \rangle$ $\mathbf{v} = \langle 0, -8 \rangle$	$66.04°$

	Questions	Answers
7	Tell if the vectors are Parallel, Orthogonal or Neither $\mathbf{u} = \langle 4, 7 \rangle$ $\mathbf{v} = \langle 14, -8 \rangle$	Orthogonal
8	Tell if the vectors are Parallel, Orthogonal or Neither $\mathbf{u} = \langle 3, 6 \rangle$ $\mathbf{v} = \langle 6, 3 \rangle$	Neither
9	Tell if the vectors are Parallel, Orthogonal or Neither $\mathbf{u} = \langle -24, 16 \rangle$ $\mathbf{v} = \langle -6, 4 \rangle$	Parallel
10	Find the Resultant Vector. $\mathbf{f} = \langle 4, -1 \rangle$ $\mathbf{v} = \langle -9, 8 \rangle$ Find: $\mathbf{f} + \mathbf{v}$	$\langle -5, 7 \rangle$
11	Find the Resultant Vector. Given: $A = (8, -7)$ $B = (-7, -10)$ Find: $4\overrightarrow{AB}$	$\langle -60, -12 \rangle$
12	Find the Resultant Vector. Given: $A = (7, 1)$ $B = (10, -5)$ $C = (6, 8)$ $D = (3, -9)$ Find: $-\overrightarrow{AB} + \overrightarrow{CD}$	$\langle -6, -11 \rangle$

	Questions	Answers
13	Write the Resultant Vector as a Linear Combination. $\mathbf{u} = 14\mathbf{i} - 48\mathbf{j}$ Find: $\sqrt{3} \cdot \mathbf{u}$	$14\sqrt{3}$
14	Write the Resultant Vector as a Linear Combination. $\mathbf{a} = -10\mathbf{i} - 3\mathbf{j}$ $\mathbf{b} = 10\mathbf{i} - 5\mathbf{j}$ Find: $-\mathbf{a} + \mathbf{b}$	$20\mathbf{i} - 2\mathbf{j}$
15	Find the Magnitude of the Vector. $\overrightarrow{CD}$ where $C = (8, -10)$ $D = (10, 9)$	$\sqrt{365}$
16	Find the Magnitude of the Vector. $\overrightarrow{CD}$ where $C = (-2, 3)$ $D = (0, 6)$	$\sqrt{13}$
17	Find the Magnitude of the Vector. $\mathbf{r} = \langle 15, 36 \rangle$	39
18	Find the Magnitude of the Vector. $\mathbf{b} = \langle 4, -\sqrt{34} \rangle$	$5\sqrt{2}$

	Questions	Answers
19	Find the Magnitude of the Vector. $-9\mathbf{i} + 12\mathbf{j}$	15
20	Find the Direction Angle of the Vector. $\overrightarrow{PQ}$ where $P = (-6, 3)$ $Q = (10, -8)$	$325.49°$
21	Find the Direction Angle of the Vector. $\mathbf{k} = \langle 24, -32 \rangle$	$306.87°$
22	Find the Direction Angle of the Vector. $-10\mathbf{i} + \sqrt{69} \cdot \mathbf{j}$	$140.28°$
23	Find the Unit Vector in the opposite direction of a. $\mathbf{a} = \langle -13, 6\sqrt{22} \rangle$	$\left\langle \frac{13}{31}, -\frac{6\sqrt{22}}{31} \right\rangle$
24	Find the Unit Vector. Given: $T = (6, -1)$ $X = (6, -5)$	$\langle 0, -1 \rangle$