

Section 1.1.

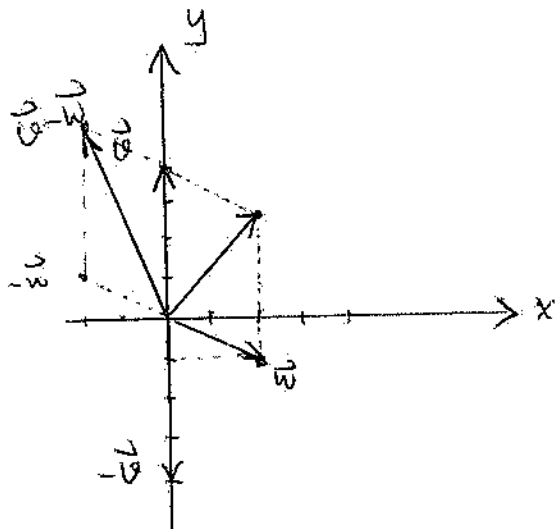
4. $(2, 3, 5) - 4\vec{i} + 3\vec{j} = (? \ ? \ ?)$.

Solution: $(2, 3, 5) - 4\vec{i} + 3\vec{j}$
 $= (2, 3, 5) + (-4, 3, 0) = (-2, 6, 5)$.

Rubric: 3 pts for ^{correct} answer, 2 pts for partial calculations.

6. $\vec{v} = (0, 4)$, $\vec{w} = (2, -1)$, sketch $-\vec{v}$, $\vec{v} + \vec{w}$, $\vec{v} - \vec{w}$, \vec{v} , \vec{w} .

Solution:



Rubrics: 1 pt for each sketch.

16 The line passing through $(0, 2, 1)$ in the direction of $2\vec{i} - \vec{k}$.
 $\vec{v} = (2, 0, -1)$.

Solution:

$$\vec{r}(t) = (0, 2, 1) + (2, 0, -1) \cdot t$$

$$= (2t, 2, 1-t) \quad \text{or} \quad \begin{cases} x = 2t \\ y = 2 \\ z = 1-t \end{cases}$$

Rubric: 3 pts for the line equation
 2 pts for correct answer.

Section 1-2.

8 $\vec{u} = 5\vec{i} - \vec{j} + 2\vec{k}$, $\vec{v} = \vec{i} + \vec{j} - \vec{k}$. Compute $\|\vec{u}\|$, $\|\vec{v}\|$, $\vec{u} \cdot \vec{v}$

Solution: $\|\vec{u}\| = \sqrt{5^2 + (-1)^2 + 2^2} = \sqrt{25 + 1 + 4} = \sqrt{30}$

$\|\vec{v}\| = \sqrt{1^2 + 1^2 + (-1)^2} = \sqrt{3}$.

$\vec{u} \cdot \vec{v} = 5 \times 1 + (-1) \times 1 + 2 \times (-1) = 2$.

Rubric: 2 pts for formulas for $\|\cdot\|$ and \cdot ,
3 pts for each answer.

18. Find all x , such that $(x, 1, x)$ and $(x, -6, 1)$ are orthogonal.

Solution: $(x, 1, x) \cdot (x, -6, 1) = 0$ *

$\Rightarrow x^2 - 6 + x = 0$

$\Rightarrow (x+3)(x-2) = 0 \Rightarrow x = 2$ or -3 .

Rubric: 3 pts for correct equation *

2 pts for 2 values of x .

26 Find the line through $(3, 1, -2)$ that intersects and is perpendicular to $x = -1+t$, $y = -2+t$, $z = -1+t$.

Solution: The direction of 2nd line is $(1, 1, 1)$.

Suppose they intersect at $(-1+t_0, -2+t_0, -1+t_0)$.

then $(3, 1, -2) - (-1+t_0, -2+t_0, -1+t_0) = (4-t_0, 3-t_0, -1-t_0)$

is perpendicular to $(1, 1, 1)$

thus $4-t_0 + 3-t_0 - 1-t_0 = 0 \Rightarrow t_0 = 2$.

Thus direction of the 1st line is

$$(4-t_0, 3-t_0, 1-t_0) = (2, 1, -3).$$

$$\text{So } \ell(t) = (3, 1, -2) + (2, 1, -3) \cdot t$$

$$= (3+2t, 1+t, -2-3t)$$

$$\text{or } \begin{cases} x = 3+2t \\ y = 1+t \\ z = -2-3t \end{cases}$$

Rubric: 2pts for finding the intersection pt.

3pts for solving the line equation.