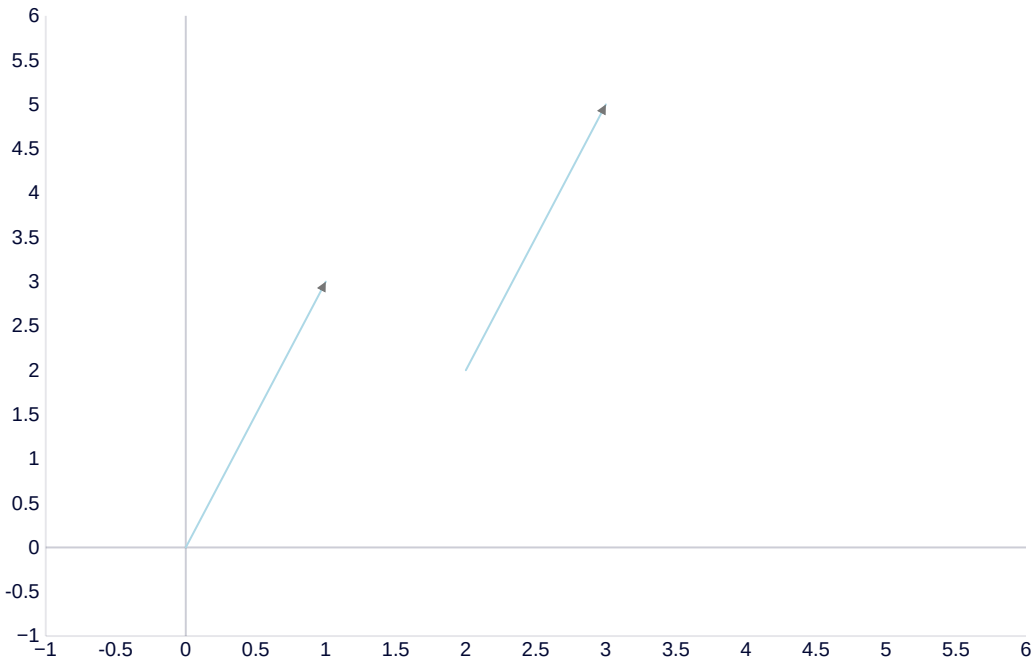
12.1

3



(3, 5)

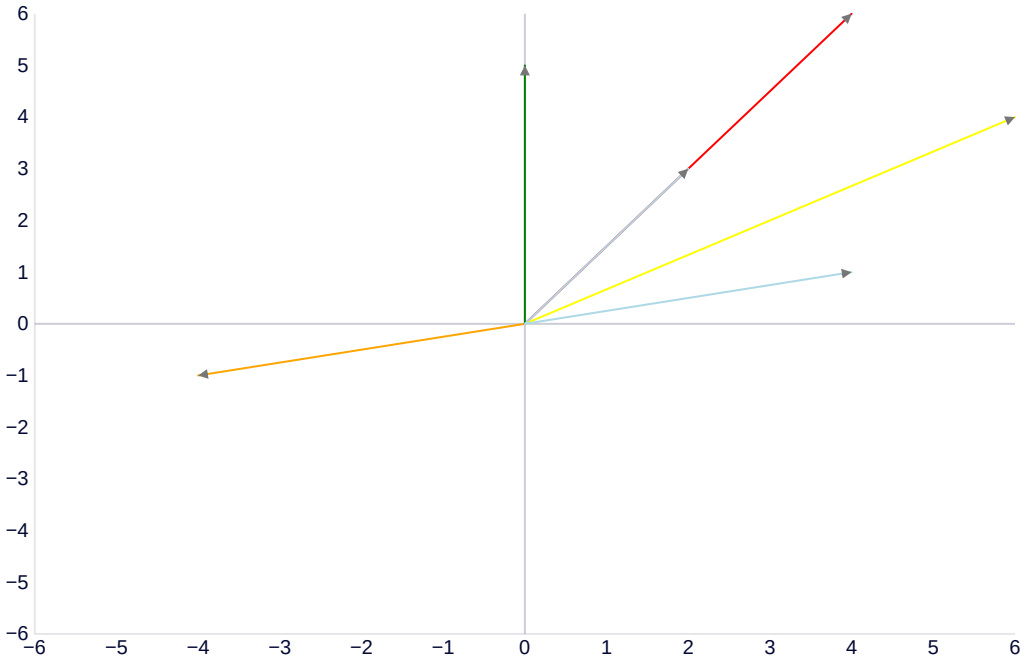
11

$\vec{PQ} = \langle -1, 24 \rangle$

21

B

23



$2\vec{v} = \langle 4, 6 \rangle = \vec{red}$
$-\vec{w} = \langle -4, -1 \rangle = \vec{orange}$
$\vec{v} + \vec{w} = \langle 6, 4 \rangle = \vec{yellow}$
$2\vec{v} - \vec{w} = \langle 0, 5 \rangle = \vec{green}$

35

Yes, and yes. $\langle 2, 3 \rangle$ and $\langle 6, 9 \rangle$ point in the same direction and are parallel.

67

$\vec{F}_1 + \vec{F}_2 = -\vec{g}$

$\langle -\|\vec{F}_1\| \cos(65^\circ), \|\vec{F}_1\| \sin(65^\circ) \rangle + \langle \|\vec{F}_2\| \cos(25^\circ), \|\vec{F}_2\| \sin(25^\circ) \rangle = \langle 0, -500 \rangle$

$\|\vec{F}_1\| \cos(65^\circ) = \|\vec{F}_2\| \cos(25^\circ)$
$\|\vec{F}_1\| \sin(65^\circ) + \|\vec{F}_2\| \sin(25^\circ) = 500$

$\|\vec{F}_2\| = \|\vec{F}_1\| \frac{\cos(65^\circ)}{\cos(25^\circ)}$
$\|\vec{F}_1\| \sin(65^\circ) + \|\vec{F}_1\| \frac{\cos(65^\circ)}{\cos(25^\circ)} \sin(25^\circ) = 500$

$\|\vec{F}_1\| (\sin(65^\circ) + \frac{\cos(65^\circ)}{\cos(25^\circ)} \sin(25^\circ)) = 500$

$\|\vec{F}_1\| (1.103) = 500$
$\|\vec{F}_1\| = 453.3$
$\|\vec{F}_2\| = 211.4$

12.2

13

A and C, $\langle 4, 8, 12 \rangle \| \langle 2, 4, 6 \rangle \| \langle -7, -14, -21 \rangle$

15

$\vec{AB} = \langle -3, -2, -1 \rangle$
$\vec{PQ} = \langle -5, -3, -6 \rangle$
No, $\vec{AB} \neq \vec{PQ}$

43

$\vec{v}(t) = \langle 1, 2, -8 \rangle + t\langle 2, 1, 3 \rangle$

45

$\vec{v}(t) = \langle 4, 0, 8 \rangle + t\langle 7, 0, 4 \rangle$

51

$\vec{v}(t) = t\langle 0, 0, 1 \rangle$

57

$\vec{r_1}(t_1) = \langle 3, -1, 4 \rangle + t_1\langle 8, 12, -6 \rangle$
$\vec{r_2}(t_2) = \langle 11, 11, -2 \rangle + t_2\langle 4, 6, -3 \rangle$

Let $t_2 = 2t_1 - 2$

$\vec{r_2}(t_2) = \langle 11, 11, -2 \rangle + (2t_1 - 2)\langle 4, 6, -3 \rangle$
$\vec{r_2}(t_2) = \langle 11, 11, -2 \rangle + 2t_1\langle 4, 6, -3 \rangle - \langle 8, 12, -6 \rangle$
$\vec{r_2}(t_2) = \langle 3, -1, 4 \rangle + t_1\langle 8, 12, -6 \rangle$

$\therefore \vec{r_1}(t) = \vec{r_2}(2t - 2)$
And do represent the same line.

61

$\vec{r_1}(t) = \langle -1, 2, 2 \rangle + t\langle 4, -2, 1 \rangle$
$\vec{r_2}(s) = \langle 0, 1, 1 \rangle + s\langle 2, 0, 1 \rangle$
$\langle -1, 2, 2 \rangle + t\langle 4, -2, 1 \rangle = \langle 0, 1, 1 \rangle + s\langle 2, 0, 1 \rangle$

$-1 + 4t = 2s$
$2 - 2t = 1$
$2 + t = 1 + s$

$t = 0.5$
$1 = 2s$
$s = 0.5$
$2.5 \neq 1.5$

Since the equations for the lines never equal, they never intersect.

65

$\vec{r}(t) = \langle 2, 1, 4 \rangle + t\langle 3, 2, -1 \rangle$
$0 = 4 - t$
$t = 4 \text{ min}$

The meteor will hit the ground after 4 minutes.