

12-1

$$5. \sin 45^\circ = \frac{\sqrt{2}}{2}$$

$$\cos 45^\circ = \frac{\sqrt{2}}{2}$$

$$\left(\frac{\sqrt{2}}{2} \|u\|, \frac{\sqrt{2}}{2} \|u\|\right)$$

$$7. \cos 20^\circ = 0.94$$

$$\sin 20^\circ = 0.34$$

$$(0.94 \|u\|, 0.34 \|u\|)$$

$$9. \vec{PQ} = [Q - P]$$

$$= (2, 7) - (3, 2)$$

$$= (-1, 5)$$

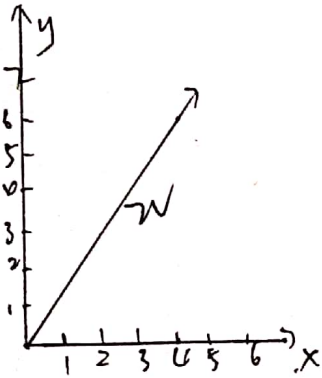
$$11. \vec{PQ} = [Q - P]$$

$$= (1, -4) - (3, 5) \rightarrow (3, 10)$$

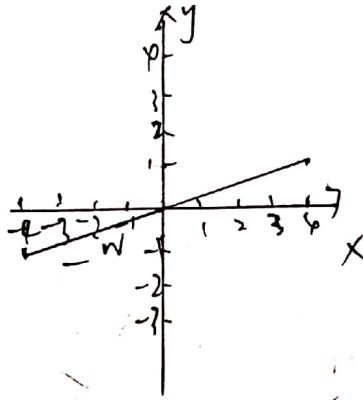
$$= (-2, -9)$$

$$15. 5(6, 2)$$

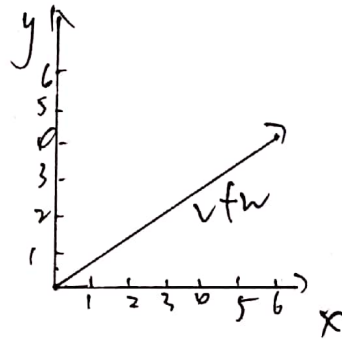
$$21. 2v = (4, 6)$$



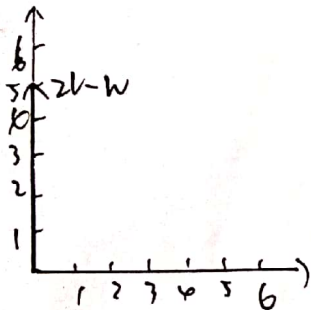
$$-w = (-4, -1)$$



$$v + w = (6, 4)$$



$$2v - w = (0, 5)$$



$$41. u = \frac{v}{\|v\|} = \frac{(3, 4)}{\sqrt{3^2 + 4^2}} = \frac{(3, 4)}{5}$$

$$\left(\frac{3}{5}, \frac{4}{5}\right)$$

$$47. \frac{4\pi}{7} = \frac{720^\circ}{7} \quad \cos \frac{720^\circ}{7} = -0.22$$

$$\sin \frac{720^\circ}{7} = 0.97$$

$$(-0.22, 0.97)$$



12-2

$$11. W = \vec{PR}$$

$$R - P = (3, 2, 3)$$

$$R = (1, 4, 3)$$

$$P = (x_1, x_2, x_3)$$

$$1 - x_1 = 3$$

$$4 - x_2 = -2$$

$$3 - x_3 = 3$$

$$x_1 = -2$$

$$x_2 = 6$$

$$x_3 = 0$$

$$P(-2, 6, 0)$$

13.

(a) parallel

$$v = 2(2, 4, 6)$$

(b) not parallel

(c) parallel

$$v = -\vec{v}(4, 8, 12)$$

(d) not parallel

$$19. (-16, -22, -6) + (8, 4, 4)$$

$$= (-8, -18, -2)$$

25. not parallel

27. Not parallel

$$31. u = \frac{v}{\|v\|} = \frac{(-4, 4, 2)}{\sqrt{16+16+4}}$$

$$= \left(\frac{-4}{6}, \frac{4}{6}, \frac{2}{6}\right)$$

$$= \left(-\frac{2}{3}, \frac{2}{3}, \frac{1}{3}\right)$$

in the direction opposite

$$\left(\frac{2}{3}, -\frac{2}{3}, -\frac{1}{3}\right)$$

$$49. r(t) = v + t$$

$$k(t) = (5, 5, 2) + t(0, -2, 1)$$

$$51. r_1(t) = (-1, 2, 2) + t(4, -2, 1)$$

$$k_2(s) = (0, 1, 1) + s(2, 0, 1)$$

$$r_1(t) = (-1 + 4t, 2 - 2t, 2 + t)$$

$$k_2(s) = (2s, 1, 1 + s)$$

$$-1 + 4t = 2s \quad \Rightarrow \quad 2 - 2t = 1 \quad 2 + t = 1 + s$$

$$2 - 2t = 1$$

$$t = \frac{1}{2}$$

plugging in to the first when  $t = \frac{1}{2}, s = \frac{1}{2}$

plugging into the third equation we get  $2 + \frac{1}{2} = 1 + \frac{1}{2}$  which is wrong

so we found a solution and this means that these two lines don't intersect

