1) $u = (4, -2, -1)$ $\quad v = (-3, 1, 2)$

$u + v = (1, -1, 1)$

2) $k = -2 \quad v = (-1, 0, -5)$

$kv = (2, 0, 10)$

3) $A = (4, 2, -6) \quad B = (-5, 3, -2)$

$A \cdot B = 4(-5) + 2(3) - 6(-2) = -20 + 6 + 12 = -2$

4) $u = (1, 2, 3) \quad v = (-1, 1, 2)$

$$u \times v = \begin{vmatrix} i & j & k \\ 1 & 2 & 3 \\ -1 & 1 & 2 \end{vmatrix} = (4-3)\hat{i} - (2+3)\hat{j} + (1+2)\hat{k}$$

$$= \hat{i} - 5\hat{j} + 3\hat{k} = (1, -5, 3)$$

5) $u = (2, 2, -1)$

$$\|u\| = \sqrt{\langle u, u \rangle} = \sqrt{4 + 4 + 1} = \sqrt{9} = 3$$

6) $k = 2 \quad A = \begin{pmatrix} 2 & -1 & -2 \\ 3 & 0 & -1 \\ 5 & 1 & 3 \end{pmatrix}$

$$kA = \begin{pmatrix} 4 & -2 & -4 \\ 6 & 0 & -2 \\ 10 & 2 & 6 \end{pmatrix}$$

7) $A = \begin{pmatrix} 1 & 2 \\ -1 & 0 \end{pmatrix} \quad B = \begin{pmatrix} -2 & 9 \\ 3 & 5 \end{pmatrix}$

$$A + B = \begin{pmatrix} -1 & 11 \\ 2 & 5 \end{pmatrix}$$

8)

$$A = \begin{pmatrix} 1 & 1 & -1 \\ 1 & 0 & 1 \\ -1 & 1 & 1 \end{pmatrix} \qquad B = \begin{pmatrix} 1/4 & 1/2 & -1/4 \\ 1/2 & 0 & 1/2 \\ -1/4 & 1/2 & 1/4 \end{pmatrix}$$

$$A \cdot B = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

9) $$A = \begin{pmatrix} 3 & 1 & -1 \\ 6 & 1 & -2 \\ 4 & -3 & 2 \end{pmatrix}$$

$$\det A = 3(2+6) - 1(12+8) - 1(-18-4)$$

$$= 3(-4) - 20 + 22 = -12 + 2 = -10$$

10) $$AB = \begin{pmatrix} 3 & 1 \\ -2 & -1 \end{pmatrix} \begin{pmatrix} 1 & 1 \\ x & -3 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$x = -2$$