

$$1) b) f(\vec{c}; \vec{d}) = -8 - 5 + 3 + 2 = -8$$

$$|\vec{c}| = \sqrt{46} \quad \rightarrow \quad \vec{c}^0 = \frac{1}{\sqrt{46}} \cdot \vec{c}$$

$$|\vec{d}| = \sqrt{15} \quad \vec{d}^0 = \frac{1}{\sqrt{15}} \cdot \vec{d}$$

$$\alpha = \text{arc cos} \frac{-8}{\sqrt{15} \cdot \sqrt{46}} = \text{arc cos} \frac{-8}{\sqrt{690}}$$

$$|\vec{c} - \vec{d}| = \left| \begin{pmatrix} 6 \\ -6 \\ -2 \\ 1 \end{pmatrix} \right| = \sqrt{36 + 36 + 4 + 1} = \sqrt{77}$$

$$c) f(\vec{e}; \vec{f}) = 11 \quad ; \quad |\vec{e}| = \sqrt{29} \quad ; \quad |\vec{f}| = \sqrt{10}$$

$$\alpha = \text{arc cos} \frac{11}{\sqrt{290}} \quad |\vec{e} - \vec{f}| = \sqrt{17}$$

$$2) \quad \vec{a} \times \vec{b} = -2 + 15 - 2y - 10 = 1 - 2y = 0$$

$$y = 1/2 \quad | \dots | = \sqrt{20,25}$$

$$= 4,5$$

$$c) \quad -32 + 12x - x^2 = 0 \quad | \cdot (-1)$$

$$x^2 - 12x + 32 = (x-8)(x-4)$$

$$x_1 = 4, \quad x_2 = 8$$

$$| \dots | = \sqrt{9+4+625+49+4}$$

$$= \sqrt{\cancel{638}}$$

$$\sqrt{77,25}$$

$$8,5$$

$$x^2 - 8x + 12 = (x-6)(x-2)$$

$$| x_1 = 4 | = \sqrt{12^2 + 13^2 + 8^2} = \sqrt{144 + 169 + 64} = \sqrt{377}$$

$$\begin{array}{l}
 \text{a)} \\
 \left| \begin{array}{l}
 2x + 5p - 2y = 6 \\
 x - p + 2y = 5 \\
 3x + 3y = -6
 \end{array} \right| \begin{array}{l}
 \uparrow + \\
 | \cdot (-2) \uparrow + \\
 | \cdot (-3) \uparrow +
 \end{array}
 \end{array}$$

$$\left| \begin{array}{l}
 x - p + 2y = 5 \\
 0 + 7p - 6y = -4 \\
 0 + 3p - 3y = -21
 \end{array} \right| \begin{array}{l}
 \uparrow + \\
 | \cdot (-2) \uparrow + \\
 | : 3
 \end{array}$$

$$\left| \begin{array}{l}
 x - p + 2y = 5 \\
 0 + 7p - 6y = -7 \\
 0 + 3p - 3y = 38
 \end{array} \right| \begin{array}{l}
 \alpha = -47 \\
 \gamma = 45 \rightarrow \\
 p = 38
 \end{array}$$

$$\begin{array}{l} \alpha + 2\beta - 3\gamma - 9\varepsilon = 0 \\ 2\alpha \quad \quad + \gamma \quad \quad + 7\varepsilon = 0 \\ -\alpha \quad \quad + \beta \quad + 2\gamma \quad \quad = 0 \\ 73\alpha \quad + 5\beta \quad + \gamma \quad + 4\varepsilon = 0 \end{array} \quad \begin{array}{l} ((-2)^+) \\ ((-3)^+) \end{array}$$

$$\begin{array}{l} \alpha + 2\beta - 3\gamma - 9\varepsilon = 0 \\ 0 \quad -4\beta + 7\gamma + 25\varepsilon = 0 \\ 0 \quad 3\beta - \gamma - 9\varepsilon = 0 \\ 0 \quad -\beta + 10\gamma + 31\varepsilon = 0 \end{array} \quad \begin{array}{l} \\ \\ \\ (1 \cdot 3)^+ \cdot (-4)^+ \end{array}$$

$$\begin{array}{l} \alpha + 2\beta - 3\gamma - 9\varepsilon = 0 \\ 0 \quad -\beta + 10\gamma + 31\varepsilon = 0 \\ 0 \quad 0 \quad + 29\gamma + 84\varepsilon = 0 \\ 0 \quad 0 \quad -33\gamma - 99\varepsilon = 0 \end{array} \quad \begin{array}{l} \\ \\ -3\varepsilon = 0 \\ -\gamma - 3\varepsilon = 0 \end{array} \quad \begin{array}{l} \\ \\ (1 \cdot 2)^+ \end{array}$$

$$\varepsilon = 0 = \gamma = \beta = \alpha \Rightarrow \mathbb{R}^4$$