

Sol. Chap 5 Prob

P1: $\vec{u} + \vec{v} = (2, 1, -1); \|\vec{u} + \vec{v}\| = \sqrt{6}$

$$\|\vec{w}\| = \sqrt{4+4+1} = 3$$

$$\|\vec{u} + \vec{v}\| = 2\|\vec{w}\| = \sqrt{6} = 6$$

P2:

$$D = \frac{|ax_0 + by_0 + c|}{\sqrt{a^2 + b^2}} = D(P_0, \Delta); P_0(x_0, y_0); \Delta: ax + by + c = 0$$

$$D = \frac{|2 - 2 + 3|}{\sqrt{5}} = \frac{3}{\sqrt{5}}$$

P3: $\vec{a} = (2, 5, 4); \vec{u} = (1, -2, 3); \|\text{proj}_{\vec{a}} \vec{u}\| = \frac{|\vec{u} \cdot \vec{a}|}{\|\vec{a}\|} = \frac{2 - 10 + 12}{\sqrt{4+25+16}} = \frac{4}{\sqrt{45}}$

$$\text{proj}_{\vec{a}} \vec{u} = \frac{\vec{u} \cdot \vec{a}}{\|\vec{a}\|^2} \vec{a} = \frac{4}{\sqrt{45}} (2, 5, 4) = \left(\frac{8}{\sqrt{45}}, \frac{20}{\sqrt{45}}, \frac{16}{\sqrt{45}} \right) = \frac{4}{3\sqrt{5}}$$

P4: $\|\vec{u} \times (\vec{v} + \vec{w})\| = 3\sqrt{10}$

P5: $(\vec{u}, \vec{v}, \vec{w}) = \begin{vmatrix} 2 & 0 & 5 \\ 1 & -1 & 0 \\ 1 & 3 & 8 \end{vmatrix} = 4$

P6: $\vec{u} = (1, 3, -4); \vec{v} = (4, 1, -2)$

$$\vec{w} = \vec{u} \times \vec{v} = (-2, -14, -11) \text{ is } \perp_{\mathbb{R}^2} (\vec{u}, \vec{v})$$

also $-\vec{w} = (2, 14, 11) \text{ is } \perp \text{ plane } (\vec{u}, \vec{v})$

