Problems 12.2, Page 74

1. Scalar 2. Scalar 3. Vector 4. Scalar

5. (a) $50\vec{\imath}$ (b) $-50\vec{\jmath}$
(c) $(50/\sqrt{2})\vec{\imath} - (50/\sqrt{2})\vec{\jmath}$
(d) $-(50/\sqrt{2})\vec{\imath} + (50/\sqrt{2})\vec{\jmath}$

11. $(\vec{v} + 2\vec{w})/3 = \frac{1}{3}\vec{v} + \frac{2}{3}\vec{w} \approx (79, 79.3, 89, 68.3, 89.3)$

13. Its velocity vector relative to the ground is $(700/\sqrt{2})\vec{\imath} + (700/\sqrt{2})\vec{\jmath} + 60\vec{\imath} = (\frac{700}{\sqrt{2}} + 60)\vec{\imath} + \frac{700}{\sqrt{2}}\vec{\jmath}$; so its ground speed is

$$\sqrt{\left(\frac{700}{\sqrt{2}} + 60\right)^2 + \left(\frac{700}{\sqrt{2}}\right)^2} \approx 744\text{km/hr}$$

and its direction is

$$\arctan \frac{\frac{700}{\sqrt{2}} + 60}{\frac{700}{\sqrt{2}}} \approx 48.3^\circ$$

east of north (or about 41.7° degrees north of east).

14. The wind's component in the north direction is $(-50/\sqrt{2})\vec{\jmath}$, so the plane must head in the direction so that the north component of its velocity vector is $(50/\sqrt{2})\vec{\jmath}$. Thus, if θ denotes the angle its heading makes with due east, then

$$\begin{aligned} 600 \sin\theta &= \frac{50}{\sqrt{2}} \\ \theta &= \arcsin \frac{1}{12\sqrt{2}} \approx 3.4^\circ \ . \end{aligned}$$