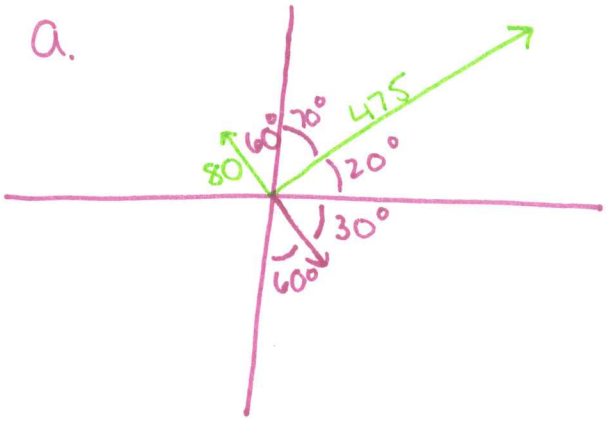
Chapter 6 Review

a.



b. groundspeed = wind + airspeed

wind = $\langle \|v\| \cos\theta, \|v\| \sin\theta \rangle$

θ = direction angle

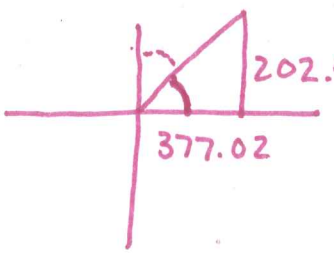
$\langle 80\cos 150, 80\sin 150 \rangle = \langle -69.282, 40 \rangle$

airspeed = $\langle \|v\| \cos\theta, \|v\| \sin\theta \rangle$

$\langle 475\cos 20, 475\sin 20 \rangle = \langle 446.354, 162.459 \rangle$

groundspeed = $\langle -69.282 + 446.354, 40 + 162.459 \rangle$

$= \langle 377.02, 202.459 \rangle$



$\tan^{-1}\left(\frac{202.459}{377.02}\right) = 28.236$

$90 - 28.236 = \boxed{61.764°}$

c. $\sqrt{377.02^2 + 202.459^2} = \boxed{427.941}$ mph

d. 60 min → $\boxed{\langle 377.02, 202.459 \rangle}$

30 min → $\boxed{\langle 188.51, 101.229 \rangle}$

→

1. $\langle 4--8, 1--12 \rangle$

$\langle 12, 13 \rangle = v$

$\|v\| = \sqrt{12^2+13^2} = \boxed{17.692}$

2a. $2v = \langle 8, 12 \rangle$

$\langle 8, 12 \rangle + \langle 0, -4 \rangle = \boxed{\langle 8, 8 \rangle}$

b. $3v = \langle 12, 18 \rangle$

$\langle 0, -4 \rangle - \langle 12, 18 \rangle = \boxed{\langle -12, -22 \rangle}$

c. $5u = \langle 0, -20 \rangle$

$\langle 0, -20 \rangle - \langle 4, 6 \rangle = \boxed{\langle -4, -26 \rangle}$

3. $v = \langle 6, -4 \rangle$

$\frac{\langle 6, -4 \rangle}{\sqrt{6^2+(-4)^2}} = \frac{\langle 6, -4 \rangle}{\sqrt{36+16}} = \frac{\langle 6, -4 \rangle}{\sqrt{52}} = \left\langle \frac{6\sqrt{52}}{52}, \frac{-4\sqrt{52}}{52} \right\rangle$

$\left\langle \frac{3\sqrt{13}}{13}, \frac{-2\sqrt{13}}{13} \right\rangle$ ↑

4. $u = \langle 7, 2 \rangle$

$v = \langle 0, -4 \rangle$

$\frac{(7)(0)+(2)(-4)}{\|u\|\|v\|} = \frac{-8}{\|u\|\|v\|}$

$\|u\| = \sqrt{49+4} = \sqrt{53}$

$\|v\| = \sqrt{0^2+(-4)^2} = 4$

$\cos\theta = \frac{-8}{4\sqrt{53}} = \boxed{105.945^\circ}$

NOT ORTHOGONAL