

$$1a. \vec{v} = 5 \cos 120^\circ \hat{i} + 5 \sin 120^\circ \hat{j} = -\frac{5}{2} \hat{i} + \frac{5\sqrt{3}}{2} \hat{j}$$

$$b. \vec{v} = 8 \cos(-3.5) \hat{i} + 8 \sin(-3.5) \hat{j} \approx -7.49 \hat{i} + 2.81 \hat{j}$$

$$2. r = \sqrt{20^2 + 20^2} = \sqrt{800} = 20\sqrt{2} \text{ magnitude}$$

$$\tan \theta = \left(\frac{20}{20}\right) \Rightarrow \theta = \frac{\pi}{4} \text{ direction}$$

$$3. F_1 = 20 \cos 45^\circ \hat{i} + 20 \sin 45^\circ \hat{j} = 10\sqrt{2} \hat{i} + 10\sqrt{2} \hat{j}$$

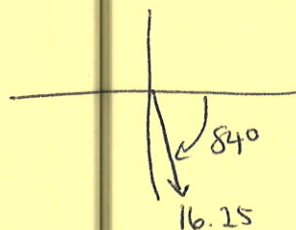
$$F_2 = 5 \cos(-60^\circ) \hat{i} + 5 \sin(-60^\circ) \hat{j} = \frac{5}{2} \hat{i} - \frac{5\sqrt{3}}{2} \hat{j}$$

$$F_3 = 30 \cos(-120^\circ) \hat{i} + 30 \sin(-120^\circ) \hat{j} = -15 \hat{i} - 15\sqrt{3} \hat{j}$$

$$\vec{F}_{\text{TOTAL}} = 1.64 \hat{i} - 16.17 \hat{j}$$

$$\|\vec{F}_T\| = 16.25$$

$$\theta = \tan^{-1}\left(\frac{-16.17}{1.64}\right) = -84.2^\circ$$



$$4. a. 5 - 6 = -1$$

$$b. 27 + 8 = 35$$

$$5. \text{proj}_{\langle 3,4 \rangle} \langle 1,-1 \rangle = \left(\frac{3-4}{5}\right) \langle 3,4 \rangle = \left\langle -\frac{3}{5}, -\frac{4}{5} \right\rangle$$

$$6. \langle 2,-4 \rangle \text{ or } \langle -2,4 \rangle \text{ or any multiple of these}$$

$$7. \vec{F} \cdot \vec{d} = W \quad \vec{F} = \langle 8,-6 \rangle$$

$$\vec{d} = \langle 6,2 \rangle$$

$$\vec{F} \cdot \vec{d} = 48 - 12 = 36 \text{ Nm}$$