Hw 2

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ⓐ $\vec{A} = \langle x_1, x_2, \dots, x_n \rangle$

$\vec{B} = \langle y_1, y_2, \dots, y_n \rangle$

$\vec{A}\cdot\vec{B} = \langle x_1 y_1, x_2 y_2, \dots, x_n y_n \rangle$ commutative

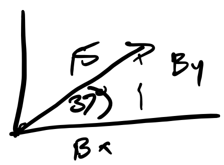
$\vec{B}\cdot\vec{A} = \langle y_1 x_1, y_2 x_2, \dots, y_n x_n \rangle$

ⓑ no clue

ⓒ

① $\vec{A} = \langle 20, 0 \rangle$

$\vec{B} = \langle 12, 9.0 \rangle$



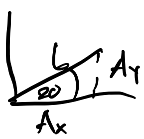
$\sin(37) = \frac{By}{15}$

$15\sin(37) = By = 9.02 = 9.0$

$15\cos(37) = Bx = 11.9 = 12$

$\vec{A}\cdot\vec{B} = 20(12) + 0(9.0) = \boxed{240}$

②



$\sin(20) = \frac{Ay}{6} \Rightarrow 6\sin(20) = Ay$

$6\cos(20) = Ax$

$\vec{A} = \langle 6\cos(20), 6\sin(20) \rangle$

$\sin(70) = \frac{By}{10} \Rightarrow 10\sin(70) = By$

$10\cos(70) = Bx$

$\vec{B} = \langle 10\cos(70), 10\sin(70) \rangle$

$\vec{A}\cdot\vec{B} = 6\cos(20)\left(10\cos(70)\right) + 6\sin(20)\left(10\sin(70)\right) = 38.56 = \boxed{38.6}$

③ $\vec{A} = \langle 3, 0 \rangle$

$\vec{B} = \langle 4, 0 \rangle$

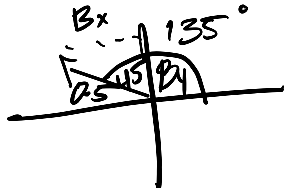
$\boxed{\vec{A}\cdot\vec{B} = 12}$

4) $\vec{A} = \langle 4, 0 \rangle$

$\vec{B} = \langle -4, 0 \rangle$

$\boxed{\vec{A} \cdot \vec{B} = -16}$

5) $\vec{A} = \langle 0.3, 0 \rangle$



$\sin(45) = \frac{Bx}{0.5} \Rightarrow Bx = \frac{1}{2}\sin(45)$

$By = \frac{\cos(45)}{2}$

$\vec{A} \cdot \vec{B} = 0.3\left(\frac{\sin(45)}{2}\right) + 0\left(\frac{\cos(45)}{2}\right) = \boxed{0.106}$

6) $\vec{A} = \langle 12, 0 \rangle$

$\vec{B} = \langle 0, 7 \rangle$

$\vec{A} \cdot \vec{B} = \boxed{0}$

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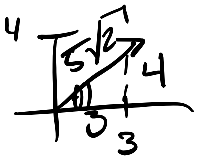
a) $\|\vec{A}\| = \sqrt{9+16+25} = \boxed{5\sqrt{2}}$

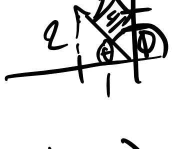
$\|\vec{B}\| = \sqrt{1+4+36} = \boxed{\sqrt{41}}$

b)



$\cos(\theta) = \frac{3}{5\sqrt{2}}$

$\theta = \cos^{-1}\left(\frac{3}{5\sqrt{2}}\right) = 64.9°$ why $\boxed{64.8°}$??



$\cos\theta = \frac{1}{\sqrt{41}} \Rightarrow \theta = \cos^{-1}\left(\frac{1}{\sqrt{41}}\right)$

$\phi = 180 - \theta \Rightarrow 98.98 \Rightarrow \boxed{99°}$

c) $\vec{A} \cdot \vec{B} = (3)(-1) + (4)(2) + (-5)(6) \Rightarrow -3 + 8 - 30$

$-\left(\frac{\overset{2}{-\cancel{33}}\,{}^{13}}{\underset{25}{8}}\right)$ | $\boxed{\vec{A} \cdot \vec{B} = -25}$

(d) $\cos\theta = \frac{\vec{A}\circ\vec{B}}{\|\vec{A}\|\|\vec{B}\|} \Rightarrow \theta = \cos^{-1}\left(\frac{-25}{(5\sqrt{2})(\sqrt{41})}\right) = 123.5$

$\Rightarrow \boxed{123.5^\circ}$

(e) $\vec{A}-\vec{B} = \langle 3, 4, -5\rangle$
$- \langle -1, 2, 6\rangle$

$\boxed{\vec{A}-\vec{B} = \langle 4\hat{i}, 2\hat{j}, -11k\rangle}$

(f) $\vec{A}\times\vec{B} = \begin{vmatrix} 3 & 4 & -5 \\ -1 & 2 & 6 \end{vmatrix}$

$\hat{i}\begin{vmatrix} 4 & -5 \\ 2 & 6 \end{vmatrix} - \hat{j}\begin{vmatrix} 3 & -5 \\ -1 & 6 \end{vmatrix} + k\begin{vmatrix} 3 & 4 \\ -1 & 2 \end{vmatrix}$

$\hat{i}(24 - -10) - \hat{j}(18-5) + k(6 - -4)$

$\boxed{34i - 13\hat{j} + 10k}$

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(a) $\vec{r}_1 = \langle 4, 3, 8\rangle$ $\quad \vec{r} = \vec{r}_2 - \vec{r}_1 = \langle -2, 7, -3\rangle$

$\vec{r}_2 = \langle 2, 10, 5\rangle$ $\quad \|\vec{r}\| = \sqrt{4+49+9} = 7.87 = \boxed{7.9}$

(b) no clue

(c) $\vec{r}_1 \times \vec{r}_2 = \begin{vmatrix} 4 & 3 & 8 \\ 2 & 10 & 5 \end{vmatrix} = \begin{vmatrix} 3 & 8 \\ 10 & 5 \end{vmatrix}\hat{i} - \begin{vmatrix} 4 & 8 \\ 2 & 5 \end{vmatrix}\hat{j} + \begin{vmatrix} 4 & 3 \\ 2 & 10 \end{vmatrix}\hat{k}$

$(15-80)\hat{i} - (20-16)\hat{j} + (40-6)\hat{k} \Rightarrow \boxed{-65\hat{i} - 4\hat{j} + 34\hat{k}}$