[2][a] $\overrightarrow{QR} = \langle 5-{}^-5, 5-1, {}^-12-{}^-6 \rangle = \langle 10, 4, {}^-6 \rangle$

$= \boxed{10\vec{\imath} + 4\vec{\jmath} - 6\vec{k}}$ $\frac{1}{2}$

[b] $\overrightarrow{QP} = -\overrightarrow{PQ} = \langle -2, 3, 5 \rangle$

$$2\overrightarrow{QP} - 3\overrightarrow{QR} = 2\langle -2, 3, 5 \rangle - 3\langle 10, 4, -6 \rangle$$

$$= \boxed{\langle -4, 6, 10 \rangle - \langle 30, 12, -18 \rangle} \; 1$$

$$= \boxed{\langle -34, -6, 28 \rangle} \; \tfrac{1}{2}$$

[c] $\|\overrightarrow{QR}\| = \boxed{\sqrt{10^2 + 4^2 + (-6)^2}}$ $\frac{1}{2}$

$= 2\sqrt{5^2 + 2^2 + (-3)^2}$

$= 2\sqrt{25 + 4 + 9}$

$= \boxed{2\sqrt{38}}$ $\frac{1}{2}$

1 $\boxed{-\frac{1}{2\sqrt{38}}\langle 10, 4, -6\rangle} = \left\langle -\frac{5}{\sqrt{38}}, -\frac{2}{\sqrt{38}}, \frac{3}{\sqrt{38}} \right\rangle$

$= \boxed{\left\langle \frac{-5\sqrt{38}}{38}, \frac{-\sqrt{38}}{19}, \frac{3\sqrt{38}}{38} \right\rangle}$ $\frac{1}{2}$

[d] $\overrightarrow{QP} \times \overrightarrow{QS} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -2 & 3 & 5 \\ -3 & 0 & 4 \end{vmatrix} \begin{matrix} \vec{i} & \vec{j} \\ -2 & 3 \\ -3 & 0 \end{matrix} = 12\vec{i} - 15\vec{j} + 8\vec{j} + 9\vec{k}$

$\frac{1}{2}$

$= \boxed{\langle 12, -7, 9 \rangle}$ $1\frac{1}{2}$

$\langle 12, -7, 9 \rangle \cdot \langle -2, 3, 5 \rangle = -24 - 21 + 45 = 0$

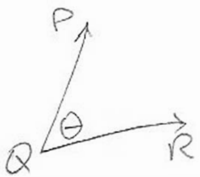
$\langle 12, -7, 9 \rangle \cdot \langle -3, 0, 4 \rangle = -36 + 0 + 36 = 0$

$\frac{1}{2}$

[e] $\frac{x+5}{-3} = \frac{z+6}{4}$, $y = 1$ $\xrightarrow{①}$ $\boxed{\frac{-x-5}{3} = \frac{z+6}{4}}$, $\boxed{y = 1}$ $\frac{1}{2}$

[f] OCTANT $2+4=\boxed{6}$ $\frac{1}{2}$

[g] $\theta = \cos^{-1} \dfrac{\overrightarrow{QP}\cdot\overrightarrow{QR}}{\|\overrightarrow{QP}\|\,\|\overrightarrow{QR}\|} = \cos^{-1} \dfrac{\langle -2, 3, 5\rangle \cdot \langle 10\ 4\ -6\rangle}{\left(\sqrt{(-2)^2+3^2+5^2}\right)\left(2\sqrt{38}\right)}$



$= \cos^{-1} \dfrac{\boxed{-20+12-30}\ 1}{\boxed{(\sqrt{38})(2\sqrt{38})}\ 1}$

$= \cos^{-1} \dfrac{-\cancel{38}}{2\cdot\cancel{38}}$

$= \boxed{\cos^{-1} -\frac{1}{2}} = \boxed{\frac{2\pi}{3} \text{ or } 120^\circ}$

$\frac{1}{2}$ $\frac{1}{2}$

SUBTRACT $\frac{1}{2}$ POINT
IF MISSING

$$\begin{array}{ccc} 0 & \frac{1}{2} & \frac{1}{2} \\ \boxed{\begin{array}{l} x = \\ y = \\ z = \end{array}} & \boxed{\begin{array}{r} -5 \\ 1 \\ -6 \end{array}} & \boxed{\begin{array}{l} +10t \\ +4t \\ -6t \end{array}} \end{array}$$

[h]

[3] [a] $\vec{w} \times \vec{u} = -(\vec{u} \times \vec{w}) = \boxed{-6\vec{i} - 3\vec{j} \text{ OR } \langle -6, -3, 0 \rangle}$ (1)

MUST HAVE ARROWHEAD (NO POINTS WITHOUT ARROWHEAD)

[b] $\vec{w} \times \vec{w} = \boxed{\vec{0}}$ (1) (TRUE FOR ALL VECTORS)

[c] $(\vec{v} \times \vec{w}) \cdot \vec{v} = \boxed{0}$ (1) (CROSS PRODUCT OF 2 VECTORS IS ALWAYS PERPENDICULAR TO BOTH VECTORS)

[4] $\vec{n} = \langle 0,3,-1\rangle \times \langle -3,0,2\rangle = \boxed{\begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 0 & 3 & -1 \\ -3 & 0 & 2 \end{vmatrix}} \begin{matrix} \vec{i} & \vec{j} \\ 0 & 3 \\ -3 & 0 \end{matrix} = \boxed{6\vec{i} + 3\vec{j} + 9\vec{k}}$ $1\frac{1}{2}$

$\frac{1}{2}$

USE $\vec{n} = \frac{1}{3}\langle 6,3,9\rangle$
$= \langle 2,1,3\rangle$

$\langle 6,3,9\rangle \cdot \langle 0,3,-1\rangle = \boxed{0+9-9} = 0$

$\langle 6,3,9\rangle \cdot \langle -3,0,2\rangle = \boxed{-18+0+18} = 0$ $\frac{1}{2}$

$2(x-0) + 1(y+3) + 3(z-2) = 0$

1 $\boxed{2x + (y+3) + 3(z-2)} \boxed{= 0}$ $\frac{1}{2}$