1) Given that that the initial and terminal points of $\vec{v}$ are $(3,2,0)$ and $(4,1,6)$ respectively find the following:

a) Component form of $\vec{v}$.

b) $\|\vec{v}\|$

c) A unit vector in the direction of $\vec{v}$.

d) Write the vector using standard unit vector notation.

a) $\boxed{\langle 1,-1,6\rangle}$

b) $\boxed{\sqrt{38}}$

c) $\boxed{\left\langle \frac{1}{\sqrt{38}},\frac{-1}{\sqrt{38}},\frac{6}{\sqrt{38}}\right\rangle}$

d) $\boxed{\mathbf{i}-\mathbf{j}+6\mathbf{k}}$

2) Find each scalar multiple of $\vec{v}=\langle 1,2,2\rangle$.

a) $2\vec{v}$ $\boxed{\langle 2,4,4\rangle}$

b) $-\vec{v}$ $\boxed{\langle -1,-2,-2\rangle}$

c) $0\vec{v}$ $\boxed{\langle 0,0,0\rangle}$

d) $\frac{3}{2}\vec{v}$ $\boxed{\left\langle \frac{3}{2},3,3\right\rangle}$

3) Find vector $\vec{z}$, given that $\vec{u}=\langle 1,2,3\rangle$, $\vec{v}=\langle 2,2,-1\rangle$, and $\vec{w}=\langle 4,0,-4\rangle$.

a) $\vec{z}=\vec{u}-\vec{v}$ $\boxed{\langle -1,0,4\rangle}$

b) $\vec{z}=2\vec{u}+4\vec{v}-\vec{w}$ $\boxed{\langle 6,12,6\rangle}$

c) $2\vec{u}+\vec{v}-\vec{w}+3\vec{z}=0$ $\boxed{\langle 0,-2,-3\rangle}$

4) Determine which of the vectors is (are) parallel to $\vec{z}$ $\vec{z} = \langle 3, 2, -5 \rangle$

a) $\langle -6, -4, 10 \rangle$ $\boxed{a) \quad and \quad b)}$

b) $\left\langle 2, \frac{4}{3}, -\frac{10}{3} \right\rangle$

c) $\langle 6, 4, 10 \rangle$

d) $\langle 1, -4, 2 \rangle$

5) Use vectors to determine whether the points $(0, -2, -5)$, $(3, 4, 4)$, $(2, 2, 1)$ are collinear.

$$\boxed{Yes}$$

6) Use vectors to show that the points $(2, 9, 1)$, $(3, 11, 4)$, $(0, 10, 2)$, $(1, 12, 5)$ form the vertices of a parallelogram.

$$\boxed{\text{Show that two pairs of vectors are parallel and opposite facing vectors have the same length.}}$$

7) Determine the values of c that satisfy the equation $\|c\vec{v}\| = 7$. Let $\vec{v} = 2\mathbf{i} + 2\mathbf{j} - \mathbf{k}$

$$\boxed{c = \pm\frac{7}{3}}$$

8) Find the vector $\vec{v}$ with a magnitude of 10 and in the same direction as $\vec{u} = \langle 0,3,3 \rangle$.

$$\boxed{\left\langle 0, \frac{10}{\sqrt{2}}, \frac{10}{\sqrt{2}} \right\rangle}$$

9) $\vec{v}$ lies in the $yz-plane$, has magnitude 2, and makes an angle of $30°$ with the positive $y-axis$. Write the component form of $\vec{v}$.

$$\boxed{\langle 0, \sqrt{3}, \pm 1 \rangle}$$

10) Let $\vec{u} = \mathbf{i} + \mathbf{j}$, $\vec{v} = \mathbf{j} + \mathbf{k}$, and $\vec{w} = a\vec{u} + b\vec{v}$.

a) If $\vec{w} = 0$, show that a and b must both be zero.
b) Find a and b such that $\vec{w} = \mathbf{i} + 2\mathbf{j} + \mathbf{k}$.
c) Show that no choice of a and b yields $\vec{w} = \mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$.

a) $\boxed{Show}$
b) $\boxed{a = 1,\ b = 1}$
c) $\boxed{Show}$