Name: ID #: Section #:

1) [**3pts**] Find the volume of the parallelepiped determined by the vectors $\vec{a} = \langle 6, 3, -1\rangle$, $\vec{b} = \langle 0, 1, 2\rangle$ and $\vec{c} = \langle 4, -2, 5\rangle$.

2) [**3pts**] Determine whether the following vectors are orthogonal, parallel or neither:

(a) $\vec{a} = \langle -5, 3, 7\rangle$, $\vec{b} = \langle 6, -8, 2\rangle$

(b) $\vec{a} = -\vec{i} + 2\vec{j} + 5\vec{k}$, $\vec{b} = 3\vec{i} + 4\vec{j} - \vec{k}$

(c) $\vec{a} = 2\vec{i} + 6\vec{j} - 4\vec{k}$, $\vec{b} = -3\vec{i} - 9\vec{j} + 6\vec{k}$

3) [**3pts**] Find a vector that has the same direction as $\langle -2, 4, 2\rangle$ but has length 6.

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1) [**4pts**] Find the volume of the parallelepiped determined by the vectors $\overrightarrow{PQ}$, $\overrightarrow{PR}$ and $\overrightarrow{PS}$, where $P(3,0,1),\ Q(-1,2,5),\ R(5,1,-1)$ and $S(0,4,2)$.

2) [**3pts**] Find the scalar and vector projection of $\vec{b} = \langle 1,2,3\rangle$ onto $\vec{a} = \langle 3,6,-2\rangle$.

3) [**3pts**] Find equations of the spheres with center $(2,-3,6)$ that touch
(a) the xy-plane,
(b) the yz-plane.