MATH 222 (Lectures 1,2,4) Worksheet 15 Fall 2015

Name: _____

Solve the following problems.

1. Let $\vec{\mathbf{a}} = \begin{pmatrix} 2 \\ 1 \\ 5 \end{pmatrix}$, $\vec{\mathbf{b}} = \begin{pmatrix} -1 \\ 2 \\ -1 \end{pmatrix}$ and $\vec{\mathbf{c}} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$. Which of the following expressions are nonsense? Evaluate the sensible ones.

   (a) $3\vec{\mathbf{a}} + \vec{\mathbf{b}}$

   (b) $\vec{\mathbf{a}} + \vec{\mathbf{c}}$

   (c) $\vec{\mathbf{a}} \cdot \vec{\mathbf{c}}$

   (d) $\vec{\mathbf{a}} - 2\vec{\mathbf{b}}$

   (e) $t\vec{\mathbf{a}}$ where t is a real number.

   (f) $\vec{\mathbf{a}}\vec{\mathbf{b}}$

   (g) $\vec{\mathbf{a}} + 5$

2. Let $\vec{\mathbf{a}} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$ and $\vec{\mathbf{b}} = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$. Find s and t so that $\begin{pmatrix} 3 \\ 5 \end{pmatrix} = s\vec{\mathbf{a}} + t\vec{\mathbf{b}}$.

3. Let $\vec{\mathbf{a}} = \begin{pmatrix} 1 \\ 2 \\ -2 \end{pmatrix}$ and $\vec{\mathbf{b}} = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$. Find $\vec{\mathbf{a}}^{/\!/}$ and $\vec{\mathbf{a}}^{\perp}$ so that $\vec{\mathbf{a}} = \vec{\mathbf{a}}^{/\!/} + \vec{\mathbf{a}}^{\perp}$, where $\vec{\mathbf{a}}^{/\!/}$ is parallel to $\vec{\mathbf{b}}$ and $\vec{\mathbf{a}}^{\perp}$ is perpendicular to $\vec{\mathbf{b}}$.

4. Let $\vec{\mathbf{a}} = \begin{pmatrix} -1 \\ 2 \\ 2 \end{pmatrix}$ and $\vec{\mathbf{b}} = \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$. Find $\vec{\mathbf{a}}^{/\!/}$ and $\vec{\mathbf{a}}^{\perp}$ so that $\vec{\mathbf{a}} = \vec{\mathbf{a}}^{/\!/} + \vec{\mathbf{a}}^{\perp}$, where $\vec{\mathbf{a}}^{/\!/}$ is parallel to $\vec{\mathbf{b}}$ and $\vec{\mathbf{a}}^{\perp}$ is perpendicular to $\vec{\mathbf{b}}$.

5. Find a parametric equation for the line that passes through the points $A = (1, 0, 2)$ and $B = (3, 1, 4)$.