Math 54 Spring 2005

Solutions to 3.2

February 6th

Section 3.2

Exercises $1-10:$ *express the given vector in terms of its coordinates.*

2. *The vector from* $(8,-1,-2,-3)$ *to* $(9,4,7,3)$.

   The vector is $(9,4,7,3)-(8,-1,-2,-3)=(1,5,9,6)$.

4. *The vector from* $(5,-1,8,-2,3)$ *to* $(5,-1,8,-2,3)$.

   The vector is $(5,-1,8,-2,3)-(5,-1,8,-2,3)=(0,0,0,0,0)$.

Exercises 7-10:

$$\mathbf{u}=\begin{bmatrix}3\\-1\\2\\4\end{bmatrix}\ \mathbf{v}=\begin{bmatrix}4\\-1\\5\\8\end{bmatrix}\ \mathbf{w}=\begin{bmatrix}8\\-7\\-6\\1\end{bmatrix}.$$

8. $2\mathbf{v}+3\mathbf{w}$.

$$2\mathbf{v}+3\mathbf{w}=2\begin{bmatrix}4\\-1\\5\\8\end{bmatrix}+3\begin{bmatrix}8\\-7\\-6\\1\end{bmatrix}=\begin{bmatrix}8\\-2\\10\\16\end{bmatrix}\begin{bmatrix}24\\-21\\-18\\3\end{bmatrix}=\begin{bmatrix}32\\-23\\-8\\19\end{bmatrix}.$$

10. $3\mathbf{v}-4(5\mathbf{u}-6\mathbf{w})$.

$$3\mathbf{v}-4(5\mathbf{u}-6\mathbf{w})=3\begin{bmatrix}4\\-1\\5\\8\end{bmatrix}-4(5\begin{bmatrix}3\\-1\\2\\4\end{bmatrix}-6\begin{bmatrix}8\\-7\\-6\\1\end{bmatrix})=\begin{bmatrix}12\\-3\\15\\24\end{bmatrix}-4(\begin{bmatrix}15\\-5\\10\\20\end{bmatrix}-\begin{bmatrix}48\\-42\\-36\\6\end{bmatrix})=$$

$$\begin{bmatrix}12\\-3\\15\\24\end{bmatrix}-4\begin{bmatrix}-33\\37\\46\\14\end{bmatrix}=\begin{bmatrix}12\\-3\\15\\24\end{bmatrix}-\begin{bmatrix}-132\\148\\184\\56\end{bmatrix}=\begin{bmatrix}144\\-151\\-169\\-32\end{bmatrix}.$$

12. *Find the distance between the given points.*

    $[5\ 1\ 8\ \ -1\ 2\ 9]\,,\,[4\ 1\ 4\ 3\ 2\ 8]\,.$

    The distance is

$$\sqrt{(5-4)^2+(1-1)^2+(8-4)^2+(-1-3)^2+(2-2)^2+(9-8)^2}=\sqrt{34}.$$

16. *Find the norm* $\left\| \begin{bmatrix} 8 \\ -1 \\ 2 \\ 5 \end{bmatrix} \right\|$

The norm is $\sqrt{8^2 + (-1)^2 + 2^2 + 5^2} = \sqrt{94}$.

18. *Find* $||\mathbf{u}|| + ||\mathbf{v}||, ||\mathbf{u} + \mathbf{v}||$ *for* $\mathbf{u} = (3, -1, -2, 1, 4), \mathbf{v} = (1, 1, 1, 1, 1)$

$||\mathbf{u}|| + ||\mathbf{v}|| = \sqrt{3^2 + (-1)^2 + (-2)^2 + 1^2 + 4^2} + \sqrt{1^2 + 1^2 + 1^2 + 1^2 + 1^2} = \sqrt{(31)} + \sqrt{(5)}$.

$||\mathbf{u} + \mathbf{v}|| = ||(4, 0, -1, 2, 5) = \sqrt{4^2 + 0^2 + (-1)^2 + 2^2 + 5^2} = \sqrt{(46)}$.