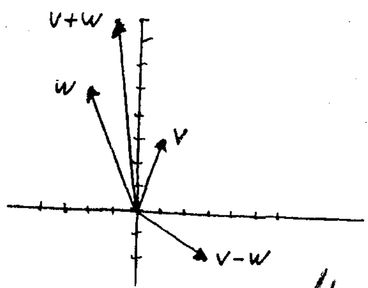
# Math 22a Fall 2009 Homework 1 Solutions

**1.1.**

2. $\mathbf{v} + \mathbf{w} = [-1, 8]$
$\mathbf{v} - \mathbf{w} = [3, -2]$




4

**§1.2**

4. $\|\mathbf{v} - 2\mathbf{u}\| = \|[2, 1, -1] - 2[-1, 3, 4]\| = \|[2, 1, -1] - [-2, 6, 8]\| = \|[4, -5, -9]\| = \sqrt{(4)^2 + (-5)^2 + (-9)^2} = \sqrt{122}$ 4

6. $\left\|\frac{4}{5}\mathbf{w}\right\| = \frac{4}{5}\|[-2, -1, 3]\| = \frac{4}{5}(\sqrt{4 + 1 + 9}) = \frac{4}{5}(\sqrt{14})$ 4

8. $\|\mathbf{v}\| = \sqrt{(-2)^2 + (-1)^2 + 3^2} = \sqrt{4 + 1 + 9} = \sqrt{14}$; $\frac{1}{\|\mathbf{v}\|}\mathbf{v} = \frac{-1}{\sqrt{14}}[-2, -1, 3] = [\frac{2}{\sqrt{14}}, \frac{1}{\sqrt{14}}, \frac{-3}{\sqrt{14}}]$ 5

10. $3\mathbf{u} + \mathbf{v} - \mathbf{w} = [3, 6, 3, 0] + [-2, 0, 1, 6] - [3, -5, 1, -2] = [3, 6, 3, 0] + [-5, 5, 0, 8] = [-2, 11, 3, 8]$ 4

22. Looking at second components, we see that to have $[c^2, -4] = r[1, -2]$, we must have $-2r = -4$, so $r = 2$. Thus $c^2 = 2(1) = 2$, so $c^2 = 2$ and $c = \pm\sqrt{2}$. 6

28. If $[1, c, c-1] = r[1, 2, 1] + s[3, 6, 3] = (r + 3s)[1, 2, 1]$, then $r + 3s = 1$, $c = 2(r + 3s)$, and $c - 1 = r + 3s$. The first and second equations yield $c = 2$, which does satisfy the third equation since $r + 3s = 1$. Thus $c = 2$. 6

29. If $[3, -2, c] = r[1, 2, -1] + s[0, 1, 3]$, then $3 = r$, $-2 = 2r + s$, and $c = -r + 3s$. The first two equations show that $s = -8$, and the last one then yields $c = -3 - 24 = -27$. 6

30. If $[c, -2c, c] = r[1, -1, 1] + s[0, 1, -3] + t[0, 0, 1]$, then $c = r$, $-2c = -r + s$, and $c = r - 3s + t$. From the first two equations, we obtain $-2c = -c + s$ so $s = -c$. The third equation then becomes $c = c + 3c + t$ so $t = -3c$. Thus we see that by taking $r = c$, $s = -c$, and $t = -3c$, we can obtain the vector $[c, -2c, c]$ for every value $c$. 6

34. $[-5, -4, -3, -2, -1] - [1, 2, 3, 4, 5] = [-6, -6, -6, -6, -6]$ 3

36. $x_1\begin{bmatrix}1\\3\end{bmatrix} + x_1\begin{bmatrix}-3\\0\end{bmatrix} + x_3\begin{bmatrix}2\\-4\end{bmatrix} + x_4\begin{bmatrix}0\\5\end{bmatrix} = \begin{bmatrix}-6\\12\end{bmatrix}$ 2

/50