Math 235

HW #1

1.1   9, 42

1.2   7, 10, 22

1.1 #9

$$[1,2,1,0] - 2[-2,0,1,6] + 4[3,-5,1,-2]$$

$$= [1,2,1,0] + [4,0,-2,-12] + [12,-20,4,-8]$$

$$= [17, -18, 3, -20]$$

1.1 #42

$$r - 2s = b_1$$
$$3r + 5s = b_2$$

$$r = b_1 + 2s$$
$$3(b_1 + 2s) + 5s = b_2$$
$$3b_1 + 11s = b_2$$
$$s = \frac{b_2 - 3b_1}{11} = \frac{1}{11}b_2 - \frac{3}{11}b_1$$

So

$$r - 2\left(\frac{1}{11}b_2 - \frac{3}{11}b_1\right) = b_1$$

$$r - \frac{2}{11}b_2 + \frac{6}{11}b_1 = b_1$$

$$r = \frac{5}{11}b_1 + \frac{2}{11}b_2$$

So

$$r = \frac{5}{11}b_1 + \frac{2}{11}b_2$$

$$s = -\frac{3}{11}b_1 + \frac{1}{11}b_2$$

This gives a solution for any b_1, b_2.

1.2 #7

$$\vec{u} = [-1, 3, 4]$$

$$\|\vec{u}\| = \sqrt{1+9+16} = \sqrt{26}$$

So $\frac{1}{\sqrt{26}}\vec{u}$ is a unit vector.

That's $\left[\frac{-1}{\sqrt{26}}, \frac{3}{\sqrt{26}}, \frac{4}{\sqrt{26}}\right]$

1.2 #10

$$[-1, 3, 4] \cdot ([2, 1, -1] + [-2, -1, 3])$$

$$= [-1, 3, 4] \cdot ([0, 0, 2])$$

$$= 8$$

1.2 #22

$$\vec{u} = [1, -1, 2, 3, 0, 4]$$
$$\vec{v} = [7, 0, 1, 3, 2, 4]$$

$$\cos\theta = \frac{\vec{u}\cdot\vec{v}}{\|\vec{u}\|\,\|\vec{v}\|}$$

$$\vec{u}\cdot\vec{v} = 7+0+2+9+0+16$$
$$= 34$$

$$\|\vec{u}\| = \sqrt{1+1+4+9+16} = \sqrt{31}$$
$$\|\vec{v}\| = \sqrt{47+1+9+4+16} = \sqrt{79}$$

So $\cos\theta = \dfrac{34}{\sqrt{31}\,\sqrt{79}}$

$$\theta = \cos^{-1}\left(\frac{34}{\sqrt{31}\,\sqrt{79}}\right) = .813 \ldots \text{ radians}$$

$$46.6 \text{ degrees (lame)}$$