Fall 2005 Math 151

**Week in Review I**
courtesy: Amy Austin
(covering sections 1.1 - 1.3 (only half of section 1.3))

Section 1.1

1. Given $A(-5, 7)$ and $B(-1, -2)$, find the vector $\mathbf{a}$ with representation $\vec{AB}$.

2. Given $\mathbf{a} = \langle -1, 2 \rangle$ and $\mathbf{b} = \langle 4, 3 \rangle$, compute the following.

   a.) $\mathbf{a} + \mathbf{b}$

   b.) $-\dfrac{1}{2}\mathbf{b}$

   c.) $\mathbf{a} - \mathbf{b}$

   d.) $2\mathbf{a} - \dfrac{1}{2}\mathbf{b}$

   e.) $|\mathbf{a}|$

3. Given that $\mathbf{a} = \langle 3, -1 \rangle$ and $\mathbf{b} = \langle 1, 2 \rangle$ and $\mathbf{c} = \langle -2, 5 \rangle$, find scalars s and t so that $s\mathbf{a} + t\mathbf{b} = \mathbf{c}$.

4. Find a unit vector in the direction of $\mathbf{a} = 3\mathbf{i} - 2\mathbf{j}$.

5. A man walks due east on the deck of a ship at 4 mph. The ship is moving $N60°E$ at a speed of 20 mph. Find the direction and speed of the man relative to the surface of the water.

6. Two forces T and S with magnitudes 4 pounds and 2 pounds act on an object at a point P as shown. Find the resultant force as well as it's magnitude and direction.
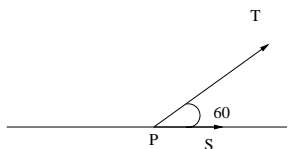
7. An 80 pound weight hangs from two wires as shown. Find the tensions (forces) in both wires and their magnitudes.
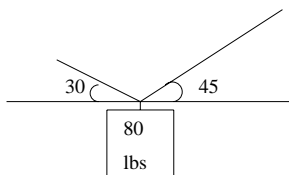
Section 1.2

8. Find $\mathbf{a} \cdot \mathbf{b}$ given the following information:

   a.) $\mathbf{a} = \langle -4, 7 \rangle$ and $\mathbf{b} = \langle 2, 1 \rangle$.

   b.) $|\mathbf{a}| = 3$, $|\mathbf{b}| = 4$, and the angle between $\mathbf{a}$ and $\mathbf{b}$ is $30°$.

9. Find the angle between the vectors $\langle 2, 0 \rangle$ and $\langle -1, 3 \rangle$.

10. Find the value(s) of x so that the following vectors are orthogonal:

    $\mathbf{a} = \langle x, 2x \rangle$ and $\mathbf{b} = \langle x, -2 \rangle$

11. Find a unit vector that is orthogonal to $\mathbf{a} = -2\mathbf{i} + \mathbf{j}$.

12. Find the scalar and vector projection of $\langle 1, 3 \rangle$ onto $\langle 7, 5 \rangle$.

13. Find the scalar and vector projection of $\langle -2, 1 \rangle$ onto $\langle 6, 1 \rangle$.

14. Find the distance from the point $(4, 1)$ to the line $y = 2x + 1$.

15. A wagon is pulled a distance of 100 m along a horizontal path by a constant force of 50 N. The handle of the wagon is at an angle of $30°$ above the horizontal. How much work is done?

16. If $A(1, 1)$, $B(3, 4)$ and $C(6, 0)$ are the vertices of $\triangle ABC$, find $\angle A$.

Section 1.3

Note: The following problems represent half of section 1.3. Next weeks Week in Review will include problems from the second half.

17. Sketch the curve:

    a.) $x = 2t - 1$, $y = 2 - t$, $-3 \le t \le 3$

    b.) $x = \sin\theta$, $y = \cos\theta$, $0 \le \theta \le \pi$

    c.) $\mathbf{r(t)} = \langle 2\sin t, 3\cos t \rangle$, $0 \le t \le 2\pi$

    d.) $x = \sqrt{t}$, $y = 1 - t$