

# Spring 2008 Math 151

## Week in Review # 1

sections: 1.1-1.2

*courtesy: Joe Kahlig*

### Section 1.1

1. Given  $A(1, 6)$  and  $B(5, -3)$ , find the vector  $\overrightarrow{BA}$ .

2. Given  $\mathbf{a} = 2\mathbf{i} + 5\mathbf{j}$  and  $\mathbf{b} = \langle 4, 1 \rangle$ . Find the following.

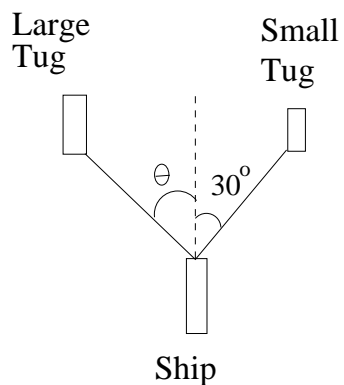
(a)  $|\mathbf{a}|$

(b)  $3\mathbf{b} - 2\mathbf{a}$

(c) Find scalars  $s$  and  $t$  so that  $s\mathbf{a} + t\mathbf{b} = \mathbf{c}$  where  $\mathbf{c} = \langle 24, -3 \rangle$

(d) Find a vector of length 3 in the opposite direction of  $\mathbf{b}$

3. Two tug boats are towing a large ship into port. The larger tug exerts a force of 4500 pounds on its cable, and the smaller tug exerts a force of 2700 pounds on its cable. If the ship is to travel in a straight line, find the angle  $\theta$  that the larger tug must make if the smaller tug makes an angle of  $30^\circ$ .



4. A pilot wishes to set a course so that his ground speed is northeast( $N45^\circ E$ ) at 180 mph. The wind is blowing in the direction of  $S30^\circ E$  at 40 mph. What course (speed and bearing) should the pilot set in order to achieve his desired ground speed?

## Section 1.2

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

(a)  $\mathbf{a} = \langle -3, 5 \rangle$  and  $\mathbf{b} = \langle 1, 2 \rangle$

(b)  $|\mathbf{a}| = 5$ ,  $|\mathbf{b}| = 12$ , and the angle between  $\mathbf{a}$  and  $\mathbf{b}$  is  $60^\circ$ .

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

7. Find the value(s) of  $x$  so that the following vectors are orthogonal:  $\mathbf{a} = \langle 2x, 5 \rangle$  and  $\mathbf{b} = \langle x, x - 5 \rangle$

8. Find a unit vector that is orthogonal to  $\mathbf{a} = 4\mathbf{i} + 3\mathbf{j}$

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

10. Find the value of  $x$  so that vector projection of  $\mathbf{b} = \langle x, 7 \rangle$  onto  $\mathbf{a} = \langle 1, 4 \rangle$  is  $\langle 5, 20 \rangle$
11. Find the distance from the point  $(4, 0)$  to the line  $y = 2x + 1$ .
12. A constant force of  $\mathbf{F} = 12\mathbf{i} + 15\mathbf{j}$ , magnitude is in Newtons, moves an object along a straight line from the point  $(1, 5)$  to the point  $(6, 8)$ . Find the work done if the distance is measured in meters.
13. A crate is pulled on a level surface for a distance of 50m under a constant force of 25N. The force is applied at an angle of  $20^\circ$  with the ground. Find the work done to move the crate.