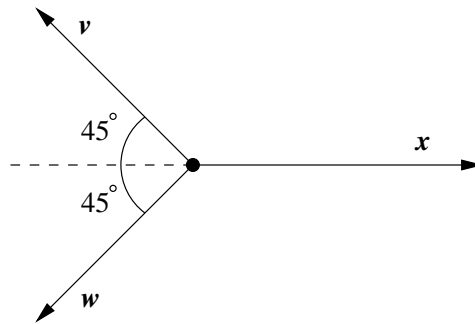


### Sample Exam 1, Math 32, Fall 2006

The following questions are included only to indicate the style of questions that will appear on Exam 1. The actual Exam 1 is likely to be longer and more difficult.

1. Sketch the object in  $\mathbb{R}^3$  (3-dimensional  $xyz$ -space) represented by the equation  $y = -2x$  on a set of  $xyz$ -axes, and in **ONE SENTENCE**, describe, as precisely as possible, what kind of geometric object this is.
2. Let  $\mathbf{a} = \langle -1, -1, 3 \rangle$ ,  $\mathbf{b} = \langle 5, 3, 2 \rangle$ . Compute the **cosine** of the angle between  $\mathbf{a}$  and  $\mathbf{b}$ . No explanation necessary, but show all of your work.
3. Let  $\mathbf{a} = \langle 2, -1, 4 \rangle$ ,  $\mathbf{b} = \langle 1, 3, -7 \rangle$ .
  - (a) Compute  $\mathbf{a} \times \mathbf{b}$ . Show all your work.
  - (b) Without further computation, what is the value of  $(\mathbf{a} \times \mathbf{b}) \cdot \mathbf{a}$ ? Briefly **justify** your answer.
4. Consider the vectors  $\mathbf{v}$ ,  $\mathbf{w}$ , and  $\mathbf{x}$  shown in the diagram below. The sizes of the vectors are not to scale, but assume that the angles are accurate as shown.



Suppose that  $\mathbf{v} + \mathbf{w} + \mathbf{x} = \mathbf{0}$  and  $|\mathbf{x}| = 3$ . Find the values of  $\mathbf{v}$  and  $\mathbf{w}$ , and write your final answer in either in  $\langle a, b \rangle$  notation or  $a\mathbf{i} + b\mathbf{j}$  notation. Carefully circle or box your final answer.

5.
  - (a) Find an equation for the plane that contains the point  $(3, -5, 7)$  and is parallel to the vectors  $\mathbf{a} = \langle 1, 0, -2 \rangle$  and  $\mathbf{b} = \langle -2, 5, 0 \rangle$ .
  - (b) Find a set of parametric equations for the line that contains the point  $(3, -5, 7)$  and is perpendicular to the plane found in part (a).