

**Topic 1: Inner Products and Perpendicular Lines**

1. Find the inner product of vectors  $a$  and  $b$  if  $a = \langle 2, 4 \rangle$  and  $b = \langle -2, 2 \rangle$
2. Are vectors  $a$  and  $b$  perpendicular? Why?
3. Vectors  $n$  and  $m$  are perpendicular. If  $n = \langle 3, 2 \rangle$  then state three different possibilities for vector  $m$ .
4. Vector  $j$  and  $k$  are perpendicular. If  $j = \langle 2, 4, -2 \rangle$  and  $k = \langle 3, -2, x \rangle$  then state the value of  $x$ .

**Topic 2: Applications**

5. Two forces are being applied to an object. The first force is 400 Newtons in the direction of the  $x$ -axis. The second is 250 newtons and makes an angle of 63 degrees to the first force.
  - a. State the resultant vector as an ordered pair.
  - b. Find the magnitude and direction of the resultant.
6. Three forces with magnitudes 50, 60, and 65 act upon an object at angles  $315^\circ$ ,  $50^\circ$ , and  $120^\circ$  respectively with the  $x$ -axis.
  - a. State each force acting upon the object algebraically
  - b. State the resultant vector as an ordered pair.
  - c. Find the magnitude and direction of the resultant.
7. Sam wishes to row his boat straight across a river. Sam can row at 5 mph in still water and the current of the river is 3 mph.  $0^\circ$  represents the line straight across the river.
  - a. What angle should Sam head to row straight across the river?
  - b. How fast will Sam travel as he travels straight across the river?
  - c. If the river is 0.5 miles straight across, then how long will the trip take?

### Topic 3: Review Materials

14. State the equation of the line that passes through (2, 4) and (3, 1)

15. Use the quadratic formula to find the roots of  $y = 2x^2 - 5$

16. Use the calculator to find all solutions for  $2^x - 1 = -x^2 + 3$

17.  $f(x) = 2x - 4$   $g(x)$  is parallel to  $f(x)$  and  $h(x)$  is perpendicular to  $f(x)$

a. State the product of the slopes for lines  $g(x)$  and  $h(x)$

b. State the sum of the slopes for lines  $g(x)$  and  $h(x)$

18. Simplify the following:

$$4x^3y(-2x^5y^2)$$

$$\frac{12x^2y^{-3}}{-4xyz^{-1}}$$

$$(3x^3 - 2x + 1) - (x^3 + x^2 - x + 7) + 1$$

19. Solve for x  $\frac{78}{x+5} + \frac{78}{x-5} = 32$