

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**MCV4U: Choice Assignment #3**  
**Due: Tuesday, March 28<sup>th</sup>, 2017**

Please answer **ten** of the following **eleven** questions. Good luck and have fun!

- 1) Prove that  $|\vec{u} \times \vec{v}| = (\vec{u} \cdot \vec{u})(\vec{v} \cdot \vec{v}) - (\vec{u} \cdot \vec{v})^2$
- 2) Find the angle between the two vectors
  - a)  $\vec{u} = [3, 4], \vec{v} = [-1, 1]$
  - b)  $\vec{u} = [-5, 6, 3], \vec{v} = [-2, 1, -2]$
- 3) Given  $\vec{u} = [-2, -3, 4]$  and  $\vec{v} = [-5, 1, 3]$ , use the cross product to find a vector which is perpendicular to both  $\vec{u}$  and  $\vec{v}$
- 4) ABCD is a parallelogram with A(-2, 4, 5), B(2, 3, 4), D(0, 2, 0). Find the area of the parallelogram using cross product.
- 5) Prove that the triple scalar product of the vectors  $\vec{u}, \vec{v}$ , and  $\vec{w}$  has the property that  $\vec{u} \cdot (\vec{v} \times \vec{w}) = (\vec{u} \times \vec{v}) \cdot \vec{w}$ . Carry out the proof by expressing both sides of the equation in terms of the components of the vectors.
- 6) For each of the following, find the projection of  $\vec{u}$  onto  $\vec{v}$  and calculate the magnitude:
  - a)  $\vec{u} = [2, 5], \vec{v} = [6, 4]$
  - b)  $\vec{u} = [-2, 4], \vec{v} = [-3, 2]$
  - c)  $\vec{u} = [3, 6, -2], \vec{v} = [-4, 3, 8]$
  - d)  $\vec{u} = [27, 11, -4], \vec{v} = [0, 0, 8]$
- 7) How much work is done by gravity in causing a 20kg rock to tumble 45m down a slope at an angle of 42 degrees to the vertical?
- 8) An object is pulled a distance of 250m by a force of 105N applied at an angle of 7 degrees to the roadway. Calculate the work done.
- 9) A jet takes off at a ground velocity of 425km/h toward the north, climbing at an angle of 11 degrees. A 15-km/h wind is from the east. Determine the resultant air and ground velocities. Include a labelled diagram in your result.
- 10) A parallelogram has an area of 205cm<sup>2</sup>. The side lengths are 90cm and 30cm. What are the measures of the angles?
- 11) A plane travels 200km [S 18° W] at an angle of elevation of 15 degrees. It then travels 300km [S 32° E] at an angle of depression of 4 degrees. How far has the plane travelled?