**West Coast Collaborative**

**Specialist Mathematics Units 3 & 4**

**Investigation 2 2017**

**Vector Applications**

**Take Home Section – due Thursday 27 April**

**Complete this Take Home Component on file paper showing all working out and reasoning. Use of CAS calculator to aid calculation is assumed. On completion of Part 1 there will be a Validation Task (Part 2). For Part 2, CAS calculators will be allowed but no other notes will be permitted.**

**Part 1: Take Home Component**

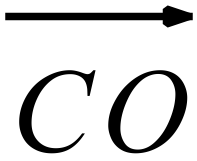
**1.** Given two points **A**<-9,3> and **P** <3,-3> determine

**a)** the vector 

**b)** the exact distance between **A** and **P**

**c)** the unit vector 

**d)** the vector equation of the line containing both points

Point C lies on the line AP such that  is perpendicular to , *0* being the Origin.

**e)** Determine the coordinates of point C.

**f)** Determine .

**2.** The position vectors (**r**) and velocity vectors (**v**) of two ships A and B at 9.00 a.m. on a particular day were as follows:   
  km  km/h.

 km  km/h.  
Show that if the two ships continue with these velocity vectors they will collide.

**3.** The position vectors (**r**) and velocity vectors (**v**) of two ships A and B at 9.00 a.m. on a particular day were as follows:   
  km km/h. 

 km  km/h.   
**a)** Show that if the two ships continue with these velocity vectors their *paths will cross* but

they will *not collide*.

**b)** Determine the angle between the ships’ respective direction vectors, giving your answer to the nearest degree.

**5.** Particle P starts moving from a point with position vector < 10, 14 > metres with constant velocity < 5, 2 > metres per second. P continues with this velocity passing a stationary object at A< 34,12 > metres. Determine the closest distance between P and A. State the position of the closest point to A and when this occurs.

**5.** Objects P and Q start moving from points with position vectors < -5, -15 > m and < 10, 20 > m with constant velocities < 3, -4 > m/s and < 1, -5 > m/s respectively. By using relative positions and relative velocities and a scalar product method, determine the closest distance between P and Q. State the positions of P and Q at the time and when this occurs.