**West Coast Collaborative**

**Test 3 2016**

**Calculator Free Section**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_\_ / 21**

**Section 1 is worth 42% of your final test mark.**

**No calculators or notes are to be used.**

**Access to approved Sample Mathematics Specialist formulae sheet**

**is permitted. Time limit = 20 minutes.**

**Question 1 [6 marks]**

A plane passes through the point P, Q, R with position vectors <1, 2, 1> , <-2, -1, 4> and <2, 1, -2> respectively. Find the vector equation of the plane in the form **r**.**n** = k.

**Question 2 [5 marks]**

A and B have position vectors of 〈2, 3, -1〉 and 〈-1, 15, 5〉 respectively. Find point C such that

AB : AC = 3 : 5

**Question 3 [2, 2, 3 marks]**

**r**(t) = (3t **i** – 2t2 **j**) meters represents the position of a particle at time t seconds.

1. Find expressions for the velocity and acceleration.
2. Find the speed when t = 1 seconds.
3. Write down the Cartesian equation of the curve.

**Question 4 [3 marks]**

Find the shortest distance from the point (2, 3, -1) to the plane 5x + 2y + 3z = 4

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**Test 3 2016**

**Calculator Section**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score: \_\_\_\_\_ / 29**

**Section 2 is worth 58% of your final test mark.**

**Calculators allowed and 1 page of A4 notes, writing on both sides.**

**Access to approved Sample Mathematics Specialist formulae sheet**

**is permitted. Time limit = 40 minutes.**

**Question 5 [6 marks]**

Find the shortest distance from (1, 4, -2) to the line containing (3, 1, -2) and (6, -2, 1).

**Question 6 [9 marks]**

Consider x + y + z =3, x – 2y + z = 6, x – y + kz = m

Find the values(s) of k and m so that the given system has:

1. a unique set of solution
2. more than one solution
3. no solution.

Find the solutions (in terms of k and m) in (a).

**Question 7 [3, 4 marks]**

The equation of a sphere is given by 2 *x* 2 + 2 *y* 2 + 2 *z* 2 - 4 *y* + 8 *x* + 12 *z* = 0.

 (a) Determine the vector equation of the sphere.

(b) Determine the position vector(s) of the points of intersection between the sphere and the line

***r*** = –3**i** + 5**j** + **k** + λ (–2**i** + **j** – 2**k**).

**Question 8 [7 marks]**

A jet travelling at <-200, 150, 0.5> km/h passes through point <50, -20, 3.8> km at 2pm one day. At the same time a light plane is at <-238, 460, 4.52> km travelling at <-80, -50, 0.2> km/h.

If the aircraft continue as above, prove that the planes will collide and find the time and place of the collision.