

**MATHEMATICS:SPECIALIST 3 & 4**

**SEMESTER 1 2017**

**TEST 3**

**Resource Free**

Reading Time: 2 minutes

Time Allowed: 18 minutes Total Marks: 17

**1.** [3, 4 marks]

(a) Solve the system of equations

(b) State the number of solutions for each of the following systems of equations. In each case, interpret the system of equations geometrically.

(i)

(ii)

**2.** [2, 2 marks]

A sphere has centre . The points and form the diameter of the sphere.

(a) Determine the values of and .

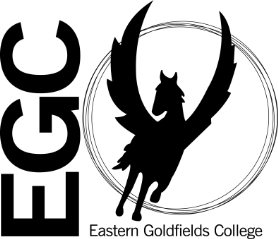
(b) Determine the vector equation of the sphere.

**3.** [2, 4 marks]

The points , and all lie in the plane .

(a) Determine the vectors and .

(b) Determine the normal equation of the plane, , in the form .



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**Resource Assumed**

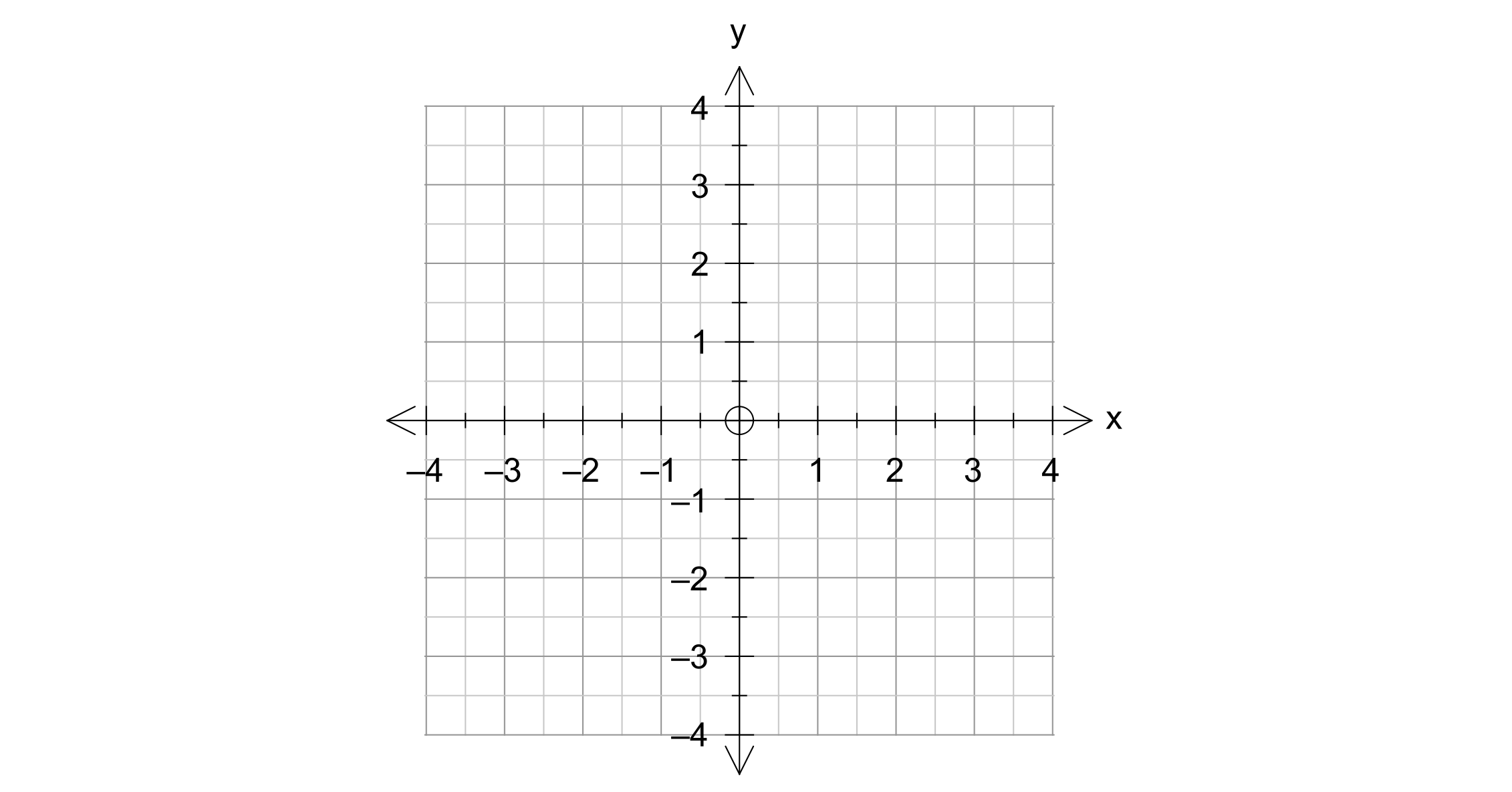
Reading Time: 2 minutes

Time Allowed: 33 minutes Total Marks: 32

**4.** [3, 3 marks]

A particle travels according to the equation .

(a) State the Cartesian equation of the path of the particle.



(b) Sketch the path of the particle for on the axes below.

**5.** [2, 3, 2, 2 marks]

The points , and form a triangle.

(a) Determine vectors and .

(b) Using the scalar product, determine the angle between vectors and .

Give your answer in radians to two decimal places.

(c) Using your answer from (b), determine the area of the triangle .

(d) Determine the exact value of , and state the geometric significance of your answer.

**6.** [6, 4 marks]

A rocket is fired with velocity km/min from a point with position vector km from some reference point . At exactly the same time a second rocket is fired from the point km with velocity km/min.

(a) Show that the rockets collide, and determine the time and position at which the collision takes place.

(b) If the second rocket had a velocity of km/min, determine the minimum distance that would occur between the two rockets. Give your answer to the nearest metres.

**7.** [1, 4, 2 marks]

A plane has Cartesian equation .

(a) Determine the normal equation for the plane.

(b) Determine the exact distance that the point is from the plane.

(c) Determine the Cartesian equation of a second plane that is parallel to the plane above, and contains the point .