**

**MATHEMATICS:**

**SPECIALIST 3 & 4**

**SEMESTER 1 2018**

**TEST 3**

**Calculator Free**

Reading Time: 2 minutes

Time Allowed: 23 minutes Total Marks: 19

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

The lines with equations and both lie in the same plane.

(a) Determine the equation of the plane in the form .

(b) Determine the Cartesian equation of the plane.

**2.** [7 marks]

On a beautiful Sunday morning on a bleak, desolate planet, Spaceman Spiff is flying in a straight line with vector equation kilometres per minute. Unbeknownst to Spaceman Spiff, a Mangzarr Beast fires a rocket that travels according to the vector equation kilometres per minute.

Determine the closest distance that the rocket gets to Spaceman Spiff.

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

(a) Solve the system of equations

(b) Consider the three planes defined by the equations:

Plane

Plane

Plane

Determine the value for that would represent the situation where Plane is parallel to Plane , with Plane intersecting both planes.

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**SEMESTER 1 2018**

**TEST 3**

**Calculator Assumed**

Reading Time: 2 minutes

Time Allowed: 33 minutes Total Marks: 31

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

Given the vectors and , determine

(a) the angle between the two vectors, to the nearest degree,

(b) the angle, to the nearest degree, between vector and the -axis,

(c) a vector of length units in the direction ,

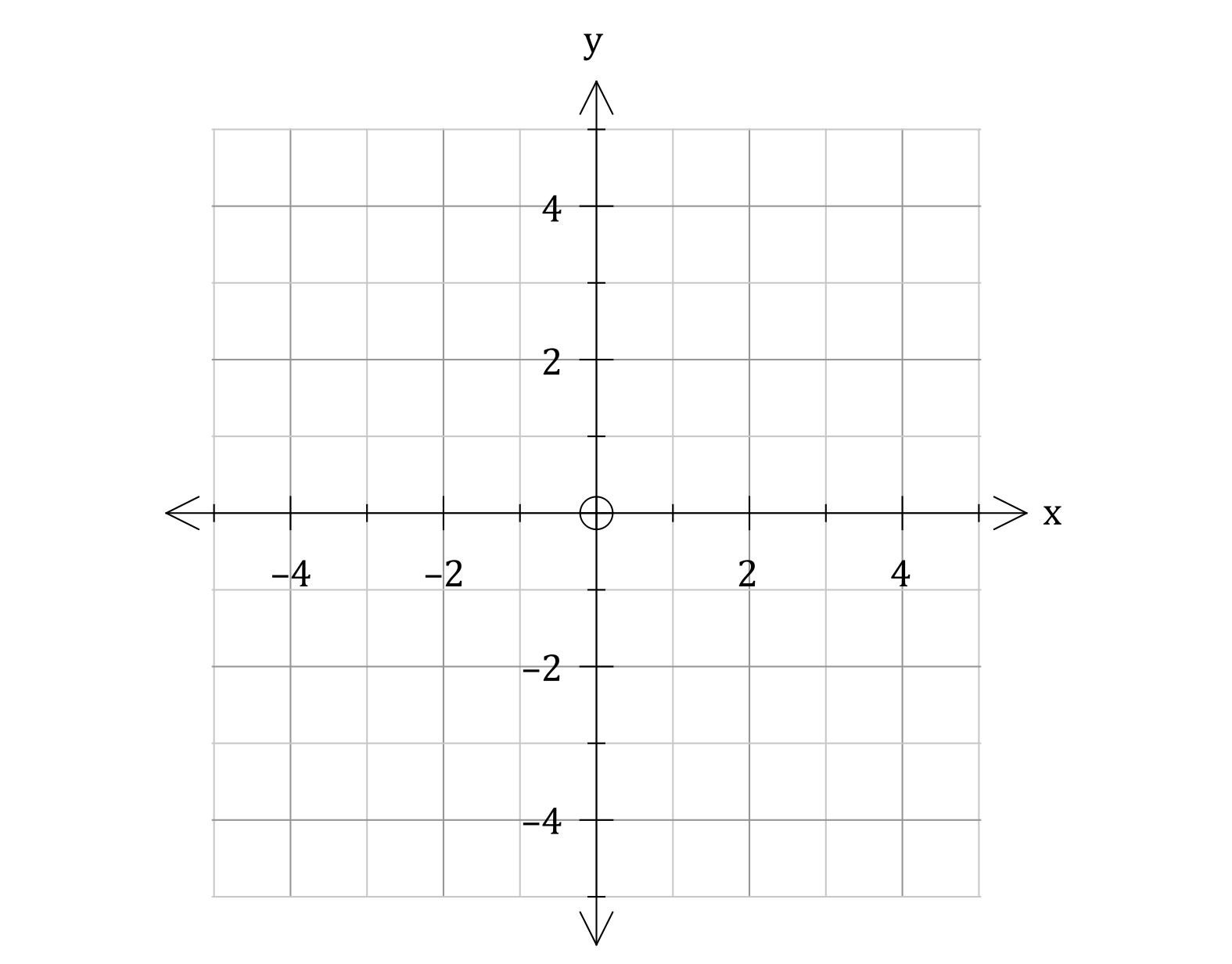
(d) the exact area of the triangle formed by the vectors and .

**5.** [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.

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**6.** [1, 5, 2 marks]

A plane has Cartesian equation .

(a) Determine the normal equation for the plane.

A sphere has equation .

(b) Determine the exact distance from the plane to the centre of the sphere.

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

**7.** [5, 4 marks]

A sphere has the vector equation .

(a) Determine the coordinates of the points, and , where the line given by the equation

intersects the sphere.

(b) Points and also lie on the sphere. Determine the angle that the points and subtend at the centre of the sphere.

Give your answer in radians to decimal places.