**Papers written by Australian Maths Software**

**SEMESTER TWO**

**MATHEMATICS SPECIALIST**

**REVISION 3**

**UNIT 3-4**

**2016**

**SOLUTIONS**

**Section One**

1. (3 marks)



✓

✓

✓

2. (5 marks)

 (a) 

 

✓

✓

✓

 (b) 

✓

 

✓

3. (7 marks)

 (a) 

 

✓

✓

✓✓

 (b) 

 

✓

✓

✓

4 (9 marks)

 (a) 

✓✓

 (b) 

 

✓

✓

✓

✓

 (c) 

✓

✓

 

✓

5. (5 marks)

 (a) 

✓

 

✓

 (b)  ✓✓✓

6. (10 marks)

 (a) 

✓

 

✓

✓

 which is parabolic

 (b) At end points when 

 

✓✓

 (c) 

 

✓

✓

✓

✓

✓

7. (5 marks)

 Since one of the direction vectors of the plane is the same as the direction vetor

 of the line, the line is either parallel ti the plane or contained IN the plane. ✓

 Need to determine if the point P(2, 0, 1) belongs to the plane.

 Plane:

 

✓

✓

✓

 Therefore the point does NOT belong to the plane.

✓

 Therefore the line is parallel to the plane.

8. (3 marks)

 

 

✓

✓

✓

9. (6 marks)

 (a)

✓✓ -1/error

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| x | -2 | -1 | 0 | 1 | 2 |
| y | 1 | 1 | 1 | 1 | 1 |
|   | **4** | **2** | **0** | **-2** | **-4** |
|

 (b)

 

✓✓ -1/error

(c)  is a sphere with centre (0, 0, 3) and radius 3.

✓



✓

**END OF SECTION ONE**

**Section Two**

10. (5 marks)

 (a) Path of insect: 

Mrs Da Cruz’s Solution:

$$r\_{I}\left(t\right)=\left(\begin{matrix}1\\-2+t\\2+2t\end{matrix}\right)cm$$

$$ \_{I}r\_{C}(t)=\left(\begin{matrix}3\\-3+t\\-1+2t\end{matrix}\right)cm $$

Distance between insect and Chameleon at any time is given by:

$$\left| \_{I}r\_{C}\right|=\sqrt{9+\left(-3+t\right)^{2}+\left(-1+2t\right)^{2}}$$

fMin on ClassPad gives:

Minimum distance is 3.74 cm at t=1sec

The insect will be dinner.

Or Closest when $\left(\begin{matrix}3\\-3+t\\-1+2t\end{matrix}\right).\left(\begin{matrix}0\\1\\2\end{matrix}\right)=0$

-3+t-2+4t=0 $∴t=1$ $∴\left| \_{I}r\_{C}\right|=\sqrt{14}≈3.74cm$

✓

 



 

✓

✓

✓

 The insect will be dinner!!!

 (b) The set of points represent a sphere of centre (1, -2, 0) and radius 3. ✓

11. (8 marks)

 Given 

 (a) (i) 

  ✓

 (ii)  ✓

 

 

 

✓

✓

 (iii)  ✓

 (b) Show that

 

✓

✓

✓

12. (12 marks)

 (a) (i)  ✓✓

 (ii) To obtain the inverse swap x and y

 

 ✓ ✓ ✓

 (b) (i)  ✓

 



 The domain is  and the range is 

 ✓ ✓

 (ii) 

 

✓

✓

 (iii) 

  is a one to one function so  is also a one to one function.

✓

✓

13. (6 marks)

 (a)  ✓✓✓

 (b) Area =  ✓✓✓



14. (7 marks)

 (a) 

✓

 

✓

✓

✓

✓

✓

 Yes, the arrow goes over the back fence.

 (b) 

✓

15. (10 marks)

 (a) 

 ✓ ✓ ✓ ✓

 (b) (i) The period is 2 cm. ✓  ✓

 (ii) 

 ✓ ✓ ✓ ✓

16. (14 marks)

 (a) 

 

✓

✓

✓

 (b) (i) 

 SHM if 

 

✓

✓

✓

 (ii) 

✓

✓

 (iii)  ✓

 (c) 

 

✓

✓

 which is constant

 (d) 

 

✓

✓

✓

17. (8 marks)

 (a) Let equation of the plane be 

 

✓

✓

✓

 (b) 

 Likewise

 The planes are parallel as the coefficients of x, y, and z are all identical. ✓

 **NB (a) and (b) can be done using vectors.**

(c) ✓✓

 (d) 

 

✓

✓

18. (8 marks)

✓

 (a) (i) 

 

✓

✓

 (ii) When a sample is taken, the range is usually smaller as it does not

 usually contain any outliers (which are rare scores).

 Most apples would be close to the mean weight, and it is unlikely to select

 an unusually big or small apple in a small sample, so a sample

 of 6 would have a small standard deviation.

✓✓

✓

 (b) The average time they would wait is is 20 minutes.

 

✓

✓

19. (7 marks)

✓

 (a) The expected mean is 160 cm.

 

✓

✓

 (b) 95% confidence limits 

 

✓

✓

 (c) To be 90% sure the confidence limits are correct, you can have a smaller ranger as there is a 10% error margin.

 To be surer, i.e. a 95% confidence limit then you have a wider range so there is

✓✓

 a bigger chance that the mean will be included.

20. (13 marks)

 (a) (i)  ✓

 (ii)  ✓

 (b) 

✓

 

✓

(c) 

 

✓

✓

✓

 

✓

(d) 



✓

✓

✓

✓

✓

**END OF SECTION TWO**

✓