2024 VCE Specialist Mathematics 1 (NHT) external assessment report

Specific information

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

Question 1ai.

Using the constant acceleration formula :



Question 1aii.

Using  gives 

Question 1b.

Given the speed after 12 seconds is  and since the car starts from rest and accelerates uniformly, the average speed over 12 seconds is . The average speed over 6 seconds is .

Question 2

Expressing  in polar form and applying De Moivre’s Theorem:



Question 3a.

 and solving  gives .

The coordinates of the points of inflection are  and . Verification that these points were points of inflection was not required.

Question 3b.

The graph of  is concave up for  or .

Question 4

The parametric equations of the line are ,  and . Substituting these into the equation of the plane:

 and so .

The point of intersection is .

Question 5

Differentiating implicitly:

.

At the point , .

Therefore  and the gradient of the line perpendicular to the curve at  is .

The equation of the line perpendicular to the curve at  is  or .

Question 6a.



Question 6b.

. The width of the confidence interval from Part 6a. is 1. The width of the new confidence interval is : a reduction of 20%.

Question 7

The area of the surface of revolution is



Question 8

For the case  in the proposition, the left-hand side is , and the right side is . Therefore, the proposition is true for .

Assume that the proposition is true for :



Then the left-hand side with  is



which is equal to the right-hand side with .

Therefore, by the principle of mathematical induction, the proposition is true for all .

Question 9a.

By implicit differentiation, 

Equivalent answers were acceptable.

Question 9b.

The rate of growth of the population is at a maximum or when half of the carrying capacity is reached.

Question 9c.



Substituting the point  gives



and so  as required.

Question 9d.

If  then . The coordinates are . Equivalent answers were acceptable.

Question 10

Using integration by parts, let , ; , . Then



Another substitution may be used to evaluate the resulting integral.

Let  and so .

When ,  and when , .

