Name: …SOLUTIONS….

Mathematics Methods, Year 12, 2018

Test 1 – Further differentiation and applications

|  |  |  |
| --- | --- | --- |
| **Total** | **/27** | **%** |

25 minutes working time.

Calculator Assumed Section (notes allowed)

SCSA Formula sheet and calculators allowed

**8. [9 marks: 3, 6]**

A closed cylindrical can of radius *r* cm has a volume of 250𝜋 cm3.

a) Show that the total surface area, *A* cm2, of this can is given by .

✓

✓

✓

b) Use derivatives to determine the minimum possible total surface area of the can, justifying that it is a minimum, and state the radius and height required to achieve this minimum area

✓

✓

✓

⇒ concave up, so minimum ✓

✓

cm2 or 471.24 cm2 ✓

**9. [10 marks: 1, 4, 5]**

The displacement, in centimetres, of a small body from a fixed point *O* after *t* seconds is given by with , where is a constant.

a) Show that the body is at *O* when .

✓

b) Given that the body has a velocity of 3 cm/s when , determine the value of the constant .

✓

✓

✓

✓

c) Determine the acceleration of the body when t > 0 and it has a velocity of 27 cm/s.

✓

✓

but so reject ✓

✓

✓

**10 [8 marks: 2, 2, 4]**

A polynomial function , where , and are real constants, has the following features:

* **only** for and
* **only** for , and
* **only** for and

a) At the point where the curve intersects the y-axis, is it concave up or concave down? Explain your answer.

concave down ✓

since ✓

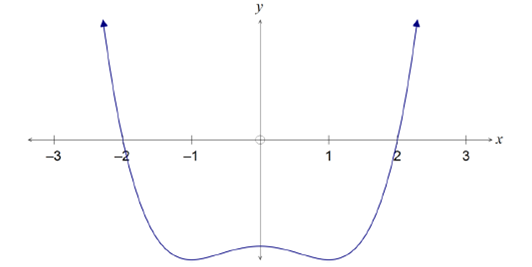
b) Is positive or negative? Explain your answer.

c is y-intercept and must be negative ✓

Only two roots, so between x=-2 and x=2 the function must always be below the x-axis, as the function is continuous and gradient at x=-2 is –ve and at x=2 is +ve.

✓

c) Sketch a possible graph of the function on the axes below.



both roots accurate ✓

three TPs at correct x-values ✓

concave down at y-intercept ✓

‘w’ shape with smooth continuous curve ✓

**END OF TEST**