Pearson Edexcel AS Mathematics 8MA0

Unit Test 6 Differentiation

Time allowed: 50 **minutes**

School:

Name:

Teacher:

Question	Points	Score
1	4	
2	5	
3	10	
4	9	
5	11	
6	11	
Total:	50	

How I can achieve better:

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1. Prove, from first principles, that the derivative of $5x^3$ is $15x^2$. [4]

2. $f(x) = x^3 - 4x^2 - 35x + 20$. [5]

   Find the set of values of x for which $f(x)$ is increasing.

3. A curve C has equation $y = x^3 - x^2 - x + 2$.

   The point P has x-coordinate 2.

   (a) Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ in terms of x. [2]

   (b) Find the equation of the tangent to the curve C at the point P. [4]

   (c) The normal to C at P intersects the x-axis at A. [4]

   Find the coordinates of A.

Total: 10

4. $f(x) = x^3 - 7x^2 - 24x + 18$. Sketch the graph of the gradient function, $y = f'(x)$. Use algebraic methods to determine any points where the graph cuts the coordinate axes and mark these on the graph. [9]

   Using calculus, find the coordinates of any turning points on the graph.

5. A fish tank in the shape of a cuboid is to be made from 1600 cm^2 of glass. The fish tank will have a square base of side length x cm, and no lid. No glass is wasted. The glass can be assumed to be very thin.

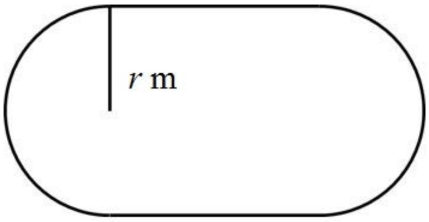
   (a) Show that the volume, V cm^3, of the fish tank is given by $V = 400x - \frac{x^3}{4}$. [5]

   (b) Given that x can vary, use differentiation to find the maximum or minimum value of V. [4]

   (c) Justify that the value of V you found in part **b** is a maximum. [2]

Total: 11

6. Figure below shows the plan of a school running track. It consists of two straight sections, which are the opposite sides of a rectangle, and two semicircular sections, each of radius r m. The length of the track is 300 m and it can be assumed to be very narrow.



(a) Show that the internal area, A m^2, is given by the formula $A = 300r - \pi r^2$. [5]

(b) Hence find in terms of π the maximum value of the internal area. You do not have to justify that the value is a maximum. [6]

Total: 11