Solomon Practice Paper

Pure Mathematics 1D

Time allowed: 90 **minutes**

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	5	
2	8	
3	8	
4	8	
5	8	
6	11	
7	13	
8	14	
Total:	75	

How I can achieve better:

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Last updated: May 5, 2023

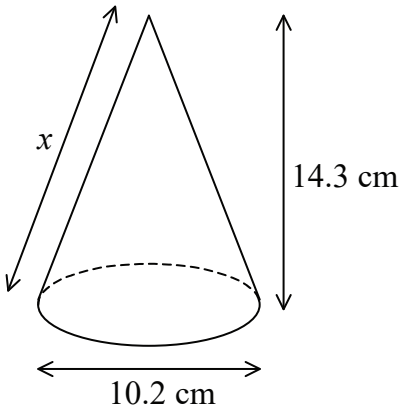
1. (a) State the condition for which the equation $ax^2 + bx + c = 0$ will have real roots. [1]

   Given that $\mathrm{f}(x) \equiv x^2 + 2px + 3x + p^2$,

   (b) prove that the equation $\mathrm{f}(x) = 0$ will have real roots only if $p \geq -\frac{3}{4}$. [4]

   Total: 5

2. Figure shows a solid right-circular cone.



   The height of the cone is 14.3 cm and the diameter of its base is 10.2 cm.

   (a) Calculate the slant height of the cone, x, in centimetres correct to 1 decimal place. [3]

   (b) Show that the surface area of the cone is 325 cm^2, correct to 3 significant figures. [5]

   Total: 8

3. $$\mathrm{f}(x) \equiv 3x^3 - 7x^2 - 22x + 8.$$

   (a) Evaluate $\mathrm{f}(-2)$. [2]

   (b) Hence state one linear factor of $\mathrm{f}(x)$. [1]

   (c) Express $\mathrm{f}(x)$ as the product of three linear factors. [5]

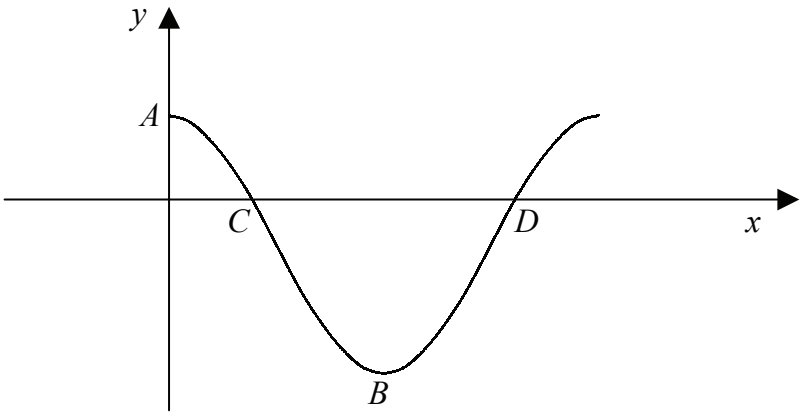
   Total: 8

4. (a) Find [4]
$$\int 6x^2 - 20x + \frac{1}{\sqrt{x}}\,\mathrm{d}x.$$

   (b) Hence, evaluate [4]
$$\int_4^5 6x^2 - 20x + \frac{1}{\sqrt{x}}\,\mathrm{d}x.$$
   giving your answer in the form $a + b\sqrt{5}$.

   Total: 8

5. Figure shows the curve with equation $y = 4\cos(x) - 1$, for x in the interval $0 \leq x \leq 2\pi$.



(a) State the coordinates of the point A, where the curve crosses the y-axis, and the point B, the first minimum on the curve for $x > 0$. [3]

(b) Find the coordinates of the points C and D, where the curve crosses the x-axis in the interval $0 \leq x \leq 2\pi$. [5]

Total: 8

6. The first term of a geometric series is $8\sqrt{3}$ and the second term is 12.

(a) Show that the common ratio of the series is $\frac{\sqrt{3}}{2}$. [3]

(b) Find the sixth term of the series. [3]

(c) Show that the sum to infinity of the series can be written as $16(2\sqrt{3}+3)$. [5]

Total: 11

7.

$$\mathrm{f}(x) \equiv (x-1)(x-a).$$

(a) Sketch the curve $y = \mathrm{f}(x)$, indicating the coordinates of any points where the curve crosses the coordinate axes in the cases for which [5]

i. $a > 1$,

ii. $a < 0$.

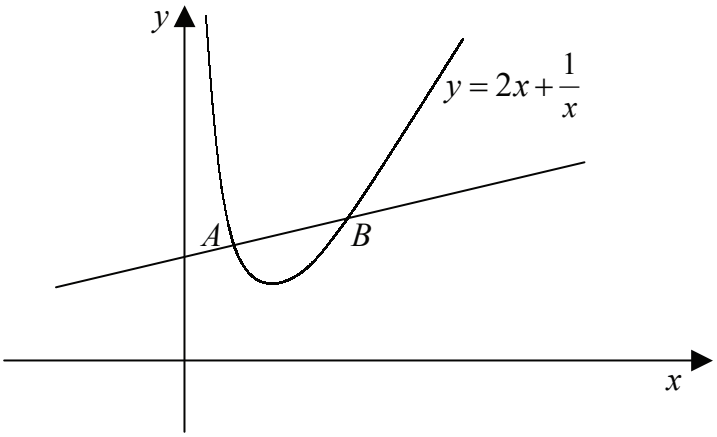
(b) Show that the coordinates of the turning point of the curve $y = \mathrm{f}(x)$ can be written as: [7]

$$\left(\frac{a+1}{2}, \frac{-(a-1)^2}{4}\right).$$

(c) Hence state the set of values for which $\mathrm{f}(x)$ is increasing. [1]

Total: 13

8. Figure shows the curve $y = 2x + \frac{1}{x}$ and the normal to the curve at the point $A\left(\frac{1}{2}, k\right)$.



(a) Find the value of k. [2]

(b) Show that the equation of the normal to the curve at A can be written as [6]

$$2x - 4y + 11 = 0.$$

The normal to the curve at A cuts the curve again at the point B.

(c) Find the coordinates of the point B, giving your answers as exact fractions. [6]

Total: 14