Solomon Practice Paper

Core Mathematics 1A

Time allowed: 90 **minutes**

Centre: **www.CasperYC.club**

Name:

Teacher:

Question	Points	Score
1	4	
2	4	
3	5	
4	6	
5	7	
6	8	
7	9	
8	10	
9	11	
10	11	
Total:	75	

How I can achieve better:

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1. (a) Express $\dfrac{21}{\sqrt{7}}$ in the form $k\sqrt{7}$. [2]

   (b) Express $8^{-\frac{1}{3}}$ as an exact fraction in its simplest form. [2]

   Total: 4

2. Evaluate [4]

$$\sum_{r=10}^{30} 7 + 2r$$

3. Differentiate with respect to x [5]

$$\frac{6x^2 - 1}{2\sqrt{x}}.$$

4. (a) Solve the inequality $x^2 + 3x > 10$. [3]

   (b) Find the set of values of x which satisfy both of the following inequalities: [3]

$$3x - 2 < x + 3 \quad \text{and} \quad x^2 + 3x > 10.$$

   Total: 6

5. The sequence $u_1, u_2, u_3, \ldots$ is defined by the recurrence relation

$$u_{n+1} = (u_n)^2 - 1, \quad n \geq 1.$$

   Given that $u_1 = k$, where k is a constant,

   (a) find expressions for u_2 and u_3 in terms of k. [3]

   Given also that $u_2 + u_3 = 11$,

   (b) find the possible values of k. [4]

   Total: 7

6. (a) By completing the square, find in terms of the constant k the roots of the equation [4]

$$x^2 + 4kx - k = 0.$$

   (b) Hence find the set of values of k for which the equation has no real roots. [4]

   Total: 8

7. (a) Describe fully a single transformation that maps the graph of $y = \frac{1}{x}$ onto the graph of $y = \frac{3}{x}$. [2]

   (b) Sketch the graph of $y = \frac{3}{x}$ and write down the equations of any asymptotes. [3]

   (c) Find the values of the constant c for which the straight line $y = c - 3x$ is a tangent to the curve $y = \frac{3}{x}$. [4]

   Total: 9

8. The points P and Q have coordinates $(7, 4)$ and $(9, 7)$ respectively.

   (a) Find an equation for the straight line l which passes through P and Q. [4]
   Give your answer in the form $ax + by + c = 0$, where a, b and c are integers.

   The straight line m has gradient 8 and passes through the origin, O.

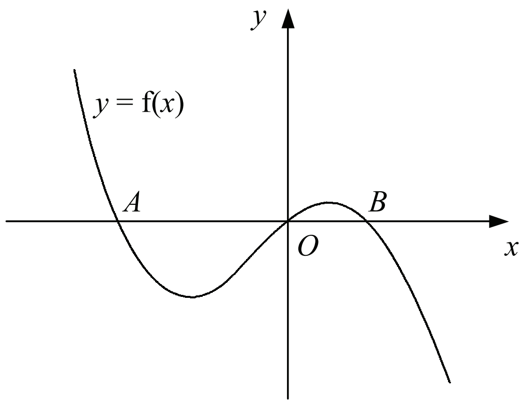
   (b) Write down an equation for m. [1]

   The lines l and m intersect at the point R.

   (c) Show that $OP = OR$. [5]

   Total: 10

9. Figure below shows the curve with equation $y = \mathrm{f}(x)$ which crosses the x-axis at the origin and at the points A and B.



   Given that

$$\mathrm{f}'(x) = 6 - 4x - 3x^2,$$

   (a) find an expression for y in terms of x, [5]

   (b) show that $AB = k\sqrt{7}$, where k is an integer to be found. [6]

   Total: 11

10. A curve has the equation $y = x + \frac{3}{x}, x \neq 0$.

   The point P on the curve has x-coordinate 1.

   (a) Show that the gradient of the curve at P is -2. [3]

   (b) Find an equation for the normal to the curve at P, giving your answer in the form $y = mx+c$. [4]

   (c) Find the coordinates of the point where the normal to the curve at P intersects the curve again. [4]

   Total: 11