

# Math SL PROBLEM SET 31

## Section A (Skills/Concepts Consolidation)

1. **(F2.3 - R) (CI)** Given the function  $f(x) = \sqrt{x}$ ,  $x \geq 0$ : **(Cirrito 6.1, 6.2; p167,177)**

a. Sketch  $f$  and label three (3) points on the graph.

The function  $h(x)$  is defined as  $h(x) = -2f(x + 9) + 6$ .

- b. State the domain and range and the  $x$ - and  $y$ -intercepts of  $h(x)$  and then sketch  $h(x)$ .  
c. Evaluate  $h^{-1}(4)$

2. **(A1.1 - R) (CA)** The sum of the first  $n$  terms of an arithmetic series is given by  $S_n = \frac{n(3n+1)}{2}$   
**(Cirrito 8.2.4, p264)**

- a. Calculate  $S_1$  and  $S_2$ .  
b. Find the first three terms of this series.  
c. Find an expression for the  $n^{\text{th}}$  term of the sequence from which the series was made.

3. **(T3.4 - R) (CI)** The table below shows the depth of water at the end of a pier at various times (measured in hours after midnight on the first day of the month.) Plot the data as a graph and determine a sinusoidal model that can be used to model the depth of the water. Use your model to predict the time of the next high tide. **(Cirrito 10.5, p361)**

$t$ (hr)	0	3	6	9	12	15	18	21	24	27	30	33
$d$ (m)	16.20	17.49	16.51	14.98	15.60	17.27	17.06	15.34	15.13	16.80	17.42	15.89

4. **(F2.5 - R) (CI)** Given the rational functions  $f(x) = \frac{x-3}{x-1}$ ,  $x \neq 1$  and  $g(x) = \frac{x+4}{x+2}$ ,  $x \neq -2$ ; **(Cirrito 5.3.5, p144)**
- a. Rewrite  $f(x)$  and  $g(x)$  in the form of  $y = \frac{a}{x-b} + c$  to help in identifying transformations of the parent function  $y = \frac{1}{x}$ ,  $x \neq 0$ .  
b. Sketch each of  $f(x)$  and  $g(x)$ .  
c. **(CA)** Find the equation of the line that is tangent to  $f(x)$  at  $x = 5$ . What is the significance of the slope of the tangent line?  
d. Solve the inequality  $f(x) > g(x)$ .

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## Section B (Skills/Concepts Practice)

5. **(A1.1 - E) (CI) SKILL:** Sigma Notation.

a. Write the following expressions as a sum of terms and then evaluate each sum.

i. 
$$\sum_{k=3}^7 \frac{k}{k+1}$$

ii. 
$$\lim_{n \rightarrow \infty} \sum_{i=1}^n (0.5)^{7-i}$$

b. **(CA)** Write each of the following sums using  $\sum$  notation and then evaluate.

i.  $3 - 9 + 27 - 81 + 243$

ii.  $\frac{1}{2} + \frac{1}{5} + \frac{1}{8} + \frac{1}{11} + \frac{1}{14} + \frac{1}{17}$

6. **(A1.2 - R) (CA) SKILL:** Laws of Exponents. Simplify the following:

a.  $\frac{b^{n+1} \times 8a^{2n-1}}{(2b)^2(ab)^{1-n}}$

b.  $\frac{2^n - 6^n}{1 - 3^n}$

c.  $\frac{7^{m+1} - 7^m}{7^n - 7^{n+2}}$

d.  $\frac{\sqrt{x} \times \sqrt[3]{x^2}}{\sqrt[4]{x}}$

7. **(A1.2 - E) (CI) SKILL:** Laws of Logs.

a. Write the following as single logarithms:

i.  $\frac{1}{2} \log_5 x + \log_5 y$

ii.  $\log_3 a + \frac{1}{3} \log_3 b - 2 \log_3 c$

iii.  $\log(2) \times \log(x)$

b. Expand each logarithm:

i.  $\log(a^3 b)^2$

ii.  $\log \frac{x}{y^5}$

iii.  $\log(\sqrt[3]{xyz^4})$

iv.  $\log(x + y + 100)$

8. **(A1.2 - E) (CI) SKILL:** Laws of Logs. Solve the following equations:

a.  $2 \log(x - 3) = \log 4 + \log(6 - x)$

b.  $\log(x + 2) + \log(x - 1) = 1$

9. **(A1.3 - E) (CA) SKILL:** Binomial Expansion.

a. Find the 5<sup>th</sup> term in the expansion of  $(x + \frac{2}{x})^{10}$ .

b. Find the coefficient of the  $x^{12}$  term in the expansion of  $(x^2 - 2)^8$ .

## Section C (Skills/Concepts HW)

10. Solve log equations: Cirrito, Ex 7.4, p228, Q5cfij

11. Binomial expansions: Cirrito, Ex 4.1.2, p102, Q2abde