

# Math SL PROBLEM SET 26

## Section A (Short Answer)

1. **(A1.2 - E) (CI)** Write each expression as the logarithm of a single quantity: ***(Cirrito 7.4, p221)***  
a.  $\log(6) + \log(x)$       b.  $\log_3(M) + \log_3(N) - 2\log_3(P)$       c.  $\log_b 12 - \frac{1}{2} \log_b(9)$

2. **(A1.2, F 2.6 - R) (CI)** For each pair of functions, state their domains and ranges and then determine the equation for  $(f \circ g)(x)$  and also the equation for  $(g \circ f)(x)$ . ***(Cirrito 2.4.2 p44; 5.3.3, p131; C5.3.4, p138)***

a.  $f(x) = \sqrt{x-1}$  and  $g(x) = 1 + 2x^2$       b.  $f(x) = e^x - 1$  and  $g(x) = 2\ln(x+1)$

3. **(A1.2, F 2.6 - R) (CI)** Determine the equation(s) of the asymptotes as well as the  $x$ - and  $y$ -intercept(s) and then sketch the functions. State the transformations that have been applied to the “parent” function for each question. ***(Cirrito 5.3.3, p131; Cirrito 5.3.4, p138)***

a.  $y(x) = -\ln(x + 4)$       b.  $y(x) = -e^x + 2$

4. **(SP5.1, SP5.2, SP5.3 - R) (CA)** A survey is carried out to find the waiting times for 100 customers at a supermarket. The results are summarized in the table below: ***(Oxford 8.5, p171; Cirrito 13.5, p482)***

Waiting Time (sec)	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100	100 - 120	120 - 140	140 - 160
Number of customers	5	15	33	21	11	7	5	2

- a. Calculate an estimate for the mean waiting time  
b. Estimate the value of the standard deviation as well as the variance of the waiting time.  
c. Draw a cumulative frequency graph (CFG) using graph paper  
d. Use the CFG to estimate the interquartile range.
5. **(T3.5 - R) (CA)** The depth,  $d$  meters, of water in a harbour varies with the tides each day. The first high tide occurs at 05:00 am with a depth of 5.8 m. The first low tide occurs at 10:30 am with a depth of 2.6 meters. ***(Cirrito 10.5, p361)***
- a. Find a trigonometric function that models,  $d$ , the depth of the water  $t$  hours after midnight.  
b. Find the depth of the water at 12 noon.  
c. A large boat needs at least 3.5 m of water to dock in the harbour. During what times after 12 noon can the boat dock safely?

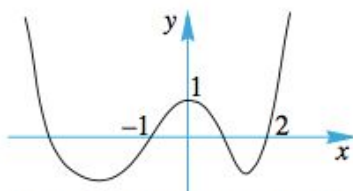
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6. **(A1.2 - N, F2.7 - E)** (CI) Solve  $\log_3(x - 2) + \log_3(x + 4) = 3$  for  $x$ . Use your TI-84 to graph and verify. Explain why there is only one solution for  $x$ . *(Cirrito 7.4, p221)*

## Section B (Extended Response/Investigation)

7. **(A1.1, F2.3, F2.6 - R)** (CI) Given the function  $f(x) = \ln(x - 3)$ , determine *(Cirrito 5.3.4, p138)*
- the domain and range of  $f$ .
  - the equation(s) of the asymptote(s) and intercept(s)
  - a sketch of  $f$ .
  - $h(x)$  represents a transformation of  $f$ . The equation for  $h(x)$  is  $h(x) = -2f(\frac{1}{2}x) + 5$ .  
Determine the:
    - transformations applied to  $f$ .
    - the intercept(s) and asymptote(s) of  $h$ .
    - the equation for the inverse function of  $h$ .
8. **(F2.3 - R)** (CI) Transformation of functions *(Cirrito 6.1, p167; Cirrito 6.2 p177; Cirrito 6.3, p183)*

The diagram shows the graph of the function  $y = f(x)$ .



Find the equation in terms of  $f(x)$  for each of the following graphs.

