# Math SL PROBLEM SET 95

Section A (Skills/Concepts Consolidation)

1. (CI) Let $f(x) = \frac{2}{x-4}$, $x \neq 4$ and let $g(x) = \frac{x}{2} - 1$, $x \neq 4$. If $h = f \circ g$, find:

    a. The equation for $h(x)$ and hence, its domain and range.
    b. The equation for $h^{-1}(x)$.

2. (CI) Consider the quadratic function $g(x) = 2x^2 - 16x + 29$.

    a. Express $g(x)$ in the form of $a(x - h)^2 + k$.
    b. State the coordinates of the vertex and the equation of the line of symmetry.
    c. Find the exact values of the x-coordinates of the zeroes of g.
    d. Is the function g a one-to-one function?

3. (CI) State the domain and range of each function:
    a. $f(x) = \sqrt{9 - x}$ b. $g(x) = \sqrt{9 - x^2}$ c. $h(x) = -3e^{2x} + 4$ d. $k(x) = \frac{1}{2x^2 - 1}$

4. (CI) Find the equation of the derivative of each function from Q3.

5. (CI) Solve each of the following equations, giving exact solutions.

    a. Solve $2^{2x} - 9(2^x) + 8 = 0$
    b. Solve $5^{2x+1} + 4(5^x) = 1$
    c. Solve $x + 1 = \sqrt{6 - 2x}$
    d. Solve $16^{x-1} = 6^{4x}$, giving your final answer in terms of $\ln 2$ and $\ln 3$.

6. (CI) Consider the function $g(x) = \ln(x + 2)$.

    a. T or F? $\ln(x + 2) = \ln(x) \times \ln(2)$. Explain your reasoning.
    b. State the domain and range of g.
    c. For the transformed function $h(x) = -2g(2x) + 3$, find the x-coordinate of the zero of h.
    d. Find the equation for g^{-1}.

7. Express as a single logarithm:
    a. $\log_2 m + \log_4 \left(\frac{1}{m}\right)$ b. $\frac{5}{2} \log_a x + \log_a (x + 1) - \log_a \sqrt{x}$

Section B (Skills/Concepts Practice)

8. For the function $f(x) = \dfrac{1}{1 - ln(\frac{2}{x})}$, determine:

   a. Find the x- and y-intercept(s) of $f(x)$, if possible.
   b. Does $f(x)$ have any asymptotes? If so, where?
   c. Hence or otherwise, determine the domain and range
   d. Find the equation of the derivative of $f(x)$.
   e. Does $f(x)$ have any stationary points?
   f. Determine the interval(s) of increase for $f(x)$.
   g. Given all this information, sketch f.

   no calculator]

   r.

   (a),
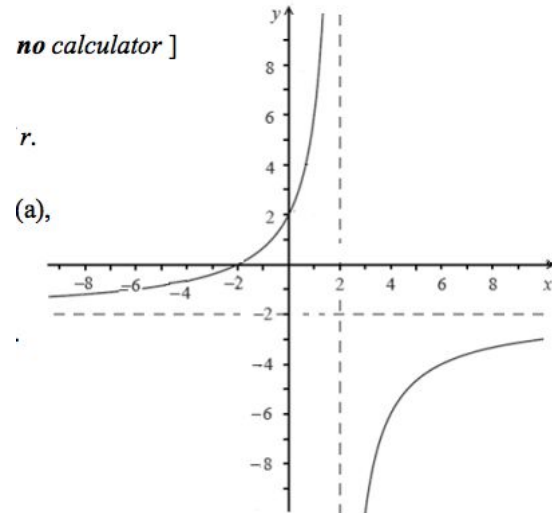
9. The graph of $h(x) = \dfrac{p+x}{q+rx}$ is shown at the right.

   a. Find the values of p, q and r.
   b. Hence, find the equation of $h^{-1}(x)$.
   c. Find the equation of $h`(x)$.

10. As per Roeland's request, here are the graphs of 2 functions, f (in red) and g (in blue). Each graph represents the DERIVATIVE of a function. For each function, prepare a graph of the ORIGINAL function.