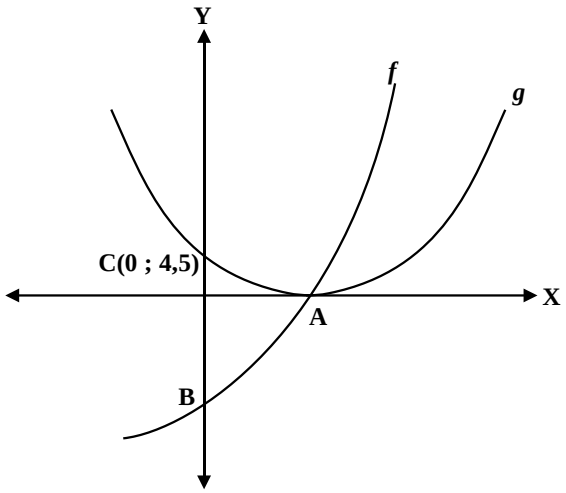
The graphs of $f(x) = 2^x - 8$ and $g(x) = ax^2 + bx + c$ sketched below. B and C$(0\ ;\ 4{,}5)$ are the y-intercepts of the graphs of f and g respectively. The two graphs intersect at A, which is the turning point of the graph of g and the x-intercept of the graphs of f and g.



(1) Determine the coordinates of A and B. (4)

A: x-intercept of g → $y = 0$

✓

→ $0 = 2^x - 8$

→ $8 = 2^3 = 2^x$

→ ∴ $x = 3$

∴ A(3 ; 0) ✓

B: y-intercept of g → $x = 0$

✓

→ $y = 2^0 - 8$

→ $y = 1 - 8$

→ $y = -7$

∴ B(0 ; −7) ✓

(2) Write down the equation of the asymptote of graph f. (1)

$y = -8$ ✓

(3) Determine the equation of h if $h(x) = f(2x) + 8$. (2)

$h(x) = f(2x) + 8 = 2^{2x} - 8 + 8$ → $h(x) = 2^{2x} = 4^x$ ✓✓

(4) Determine the equation of h^{-1} in the form $y = \ldots..$ (2)

h^{-1}: $x = 4^y$ → $y = \log_4 x$ ✓✓

(5) Write down the equation of p, if p is the reflection of h^{-1} in the x-axis. (1)

$p(x) = -\log_4 x$ or $p(x) = \log_{\frac{1}{4}} x$ ✓

(6) Calculate $\sum_{k=0}^{3} g(k) - \sum_{k=4}^{5} g(k)$. Show ALL calculations. (4)

$= [g(0) + g(1) + g(2) + g(3)] - [g(4) + g(5)]$ ✓

$= g(0) + g(1) + g(2) + g(3) - g(4) - g(5)$ **with $x = 3$ the line of symmetry**

$= g(0) + g(3)$ ✓ **because** $g(1) = g(5)$ **and** $g(2) = g(4)$

$= 4,5 - 0$ ✓ → **Given C$(0\,;\,4,5)$ and calculated in (a) A$(3\,;\,0)$**

$= 4,5$ ✓