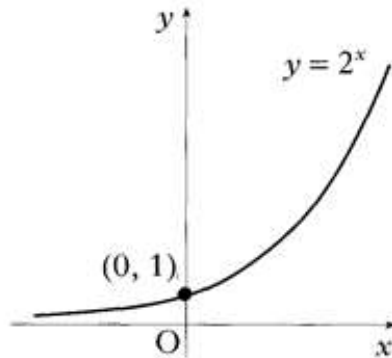


Higher Ink Exercise
Block 2 – Exponential & Logarithmic Functions

Calculators should only be used when necessary

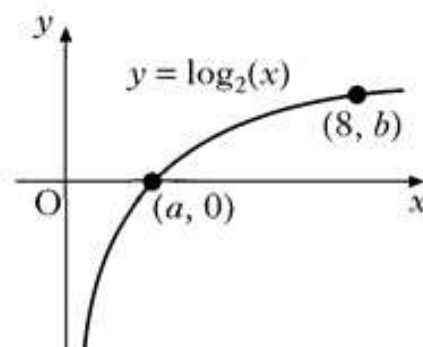
1. Part of the graph of $f(x) = 2^x$ is shown below.



- Sketch the graph of the inverse of this function. Label where this graph cuts the y-axis.
- Sketch the graph of $f(x) = 3f(x)$.
- Sketch the graph of $f(x) = 2f(x) + 1$.
- Sketch the graph of $f(x) = 2^{-x} - 8$. Label where this graph cuts both axes.

[8]

2. The diagram below shows part of the graph of $y = \log_2(x)$.



- Find the values of a and b.
- State the function of the inverse of this graph.
- Sketch the graph of $y = \log_2(x + 1) - 3$.

[5]

3. Solve to 2d.p:

a) $5^x = 4.6$

b) $\log_x 6 = 15$

c) $e^x = 552$

d) $9^{4x+2} = 80$ e) $\log_4 16 + \log_4 1024 = x$ f) $\log_2(x+2)^3 + \log_6 36 = \log_2(x-1)$

[10]

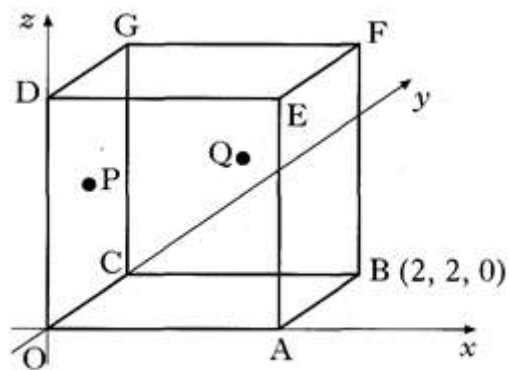
4. Find the range of values of k such that the equation $kx^2 - x - 1 = 0$ has no real roots.

[4]

5. Factorise fully $f(x) = x^3 - 3x + 2$.

[5]

6. OABCDEFG is a cube. P is the centre of the face OCGD. Q is the centre of the face BCGF.



- Find the coordinates of G.
- Find the position vectors \mathbf{p} and \mathbf{q} .
- Find the size of the angles POQ.

[8]

Total [45]

Higher Ink Exercise
Block 2 – Exponential and Logarithmic Functions

Marking Scheme

Question 1

a)

- Reflected on $y = x$.
- Point (1, 0) noted.

b)

- Point (0,3) noted

c)

d)

- Reflected on $y = x$
- Moved down 8 places

Question 2

a)

- $a = 1$
- $b = 3$

b)

- $y = 2^x$

c)

Question 3

a)

- 0.948

b)

- $6^x = 15$
- $x \log 6 = \log 15$
- $x = \log 15 / \log 6 = 1.51$

c)

- $\ln 552$
- $= 6.31$

d)

- $\log 9^{4x+2} = \log 80$
- $4x+2 = \log 80 / \log 9$
 $4x+2 = 1.99\dots$
- $x = -1.41 \times 10^{-3}$

e)

- $\log_4 16 = 2$
- $\log_4 1024 = 5$
- 7

f)

Question 4

- $b^2 - 4ac < 0$

- $(-1)^2 - 4(k)(-1) < 0$
- $1 + 4k < 0$
- $k < -1/4$

Question 5

- Finding $(x-1)$ to be a factor
- $(x - 1)(x^2 - x - 2)$
- $(x - 1)(x - 2)(x + 1)$

Question 6

a)

- $G(0, 2, 2)$

b)

- $\begin{matrix} 0 \\ \mathbf{p} = 1 \\ 1 \\ 1 \end{matrix}$
- $\begin{matrix} \mathbf{q} = 2 \\ 1 \end{matrix}$

c)

- $\mathbf{p \cdot q} = 0 \times 1 + 1 \times 2 + 1 \times 1 = 3$
- $|\mathbf{p}| = \sqrt{(0^2 + 1^2 + 1^2)} = \sqrt{2}$
- $|\mathbf{q}| = \sqrt{(1^2 + 2^2 + 1^2)} = \sqrt{6}$
- $\cos \emptyset = 3/(\sqrt{2}\sqrt{6}) = \sqrt{3}/2$
- $\emptyset = 30^\circ$