AQA, Edexcel, OCR, MEI

A Level

A Level Mathematics

C2 Logarithms (Answers)

Name:

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Total Marks: /57

C2 - Logarithms (Answers)
MEI, OCR, AQA, Edexcel

1. Simplify the following expressions:
   (a) $2\log_{10} a$. [1]
   (b) $\log_{10} ab$. [1]
   (c) 1. [2]
   (d) $10\log_{10} a$. [2]
   (e) $-\log_{10} y$. [2]
   (f) $\log_{10}(x-2)$. [2]

2. Evaluate the following expressions:
   (a) 3. [1]
   (b) 1. [1]
   (c) 0. [1]
   (d) 3. [1]

3. Solve the following equations. Give your answer to two decimal places where necessary:
   (a) $x = 2$. [1]
   (b) $x = 3.10$. [3]
   (c) $x = -2.32$. [3]
   (d) $x = 0.5$. [4]
   (e) $x = -0.55$. [4]
   (f) $x = \frac{\log_{10} a}{2\log_{10} a - 3\log_{10} b}$ [4]

4. Sketch the following functions, clearly indicating the points of any intersections with the axes:

(a) [2]

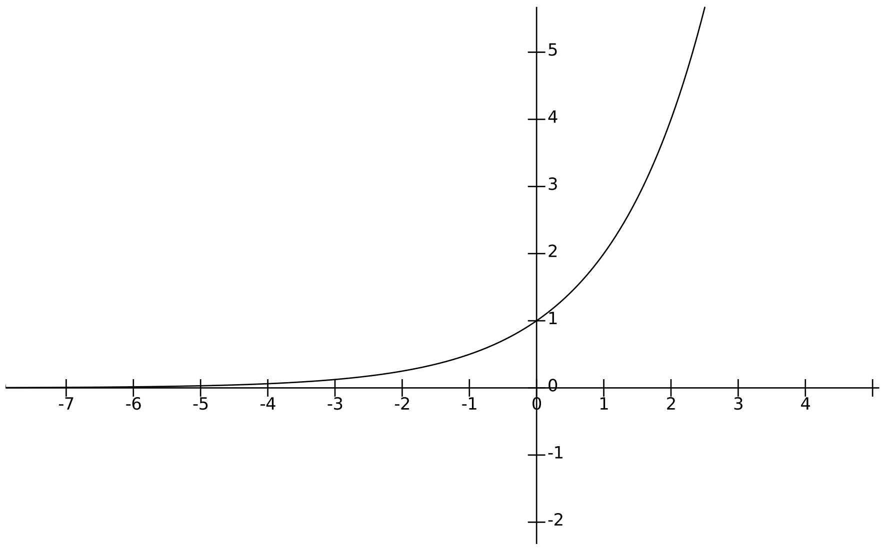

Figure 1: $y = 2^x$.

(b) [2]

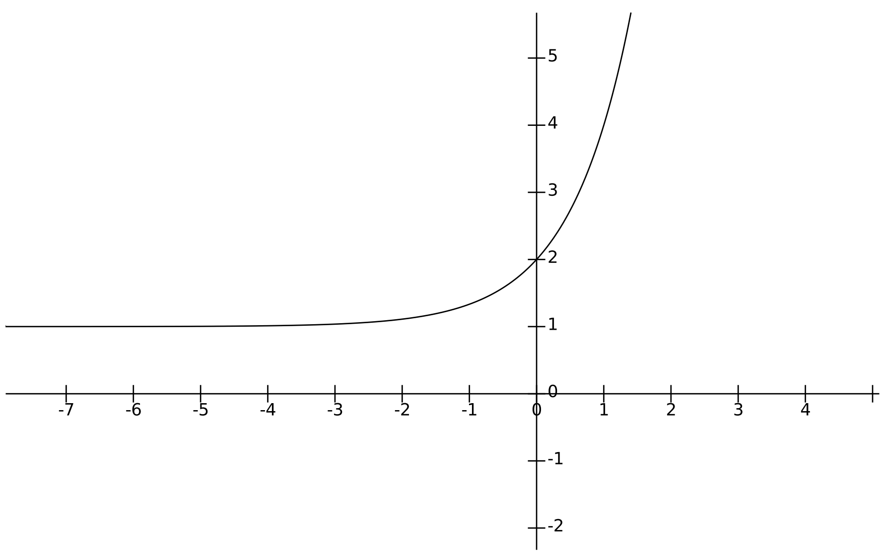

Figure 2: $y = 3^x + 1$.

(c) [2]

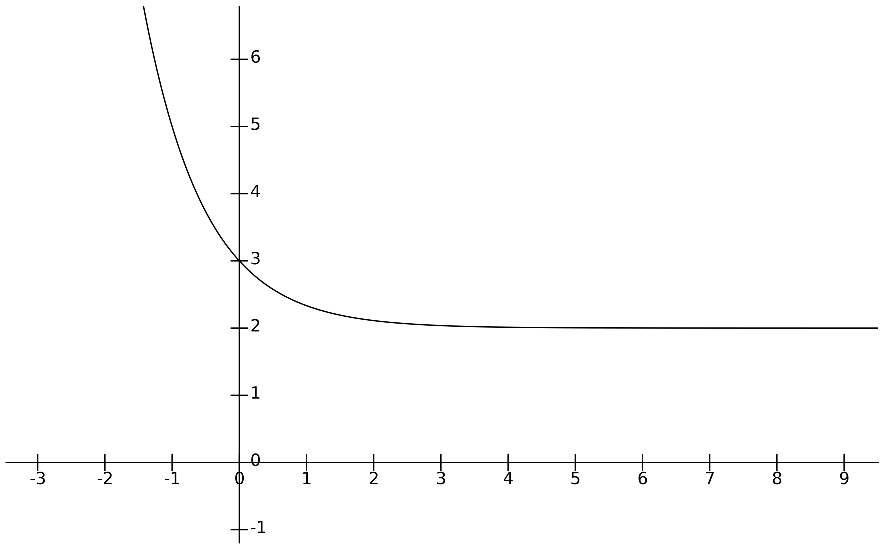

Figure 3: $y = 3^{-x} + 2$.

(d) [2]

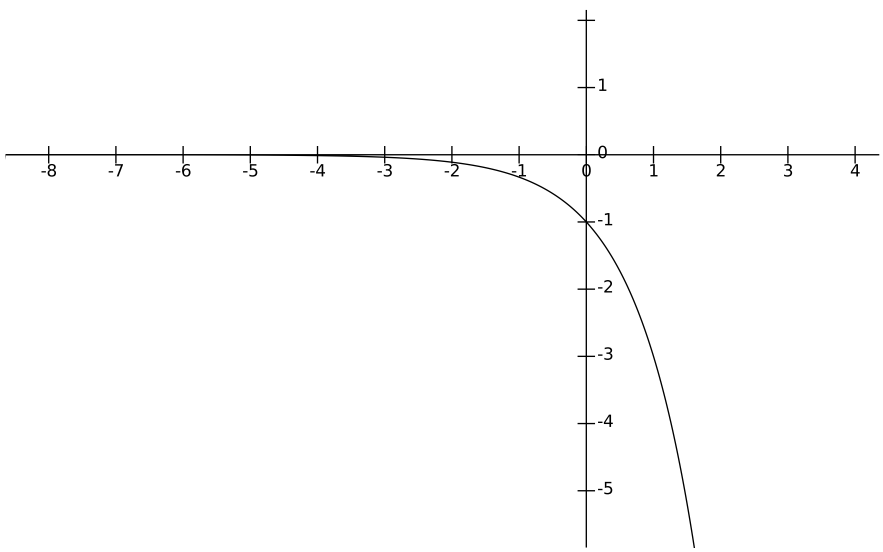

Figure 4: $y = -3^{x}$.

5. $y = 20x^2$ [4]

6. Suppose that you invest £100 into a bond that pays 2% interest each year. That is, at the end of each year the value of the bond increases by 2% of its total value at that point in time. Let the value of the bond at the end of year n be B_n, where n is an integer. At the end of year one the bond is worth $100 \times 1.02 =$£102. Its value at the end of year two is $102 \times 1.02 =$£104.04. Hence $B_1 = 102$ and $B_2 = 104.04$.

   (a) $B_3 = 106.12$. [2]

   (b) $B_n = 100 \times (1.02)^n$ [2]

   (c) We solve $100 \times (1.02)^n > 150$. This reduces to:

   $$(1.02)^n > \frac{3}{2}$$

   We take logs on both sides:

   $$n \log_{10} 1.02 > \log_{10} \frac{3}{2},$$

   and rearrange to get:

   $$n > \frac{\log_{10} \frac{3}{2}}{\log_{10} 1.02} = 20.4753 \cdots .$$

   Hence, the bond will be worth more than £150 at the end of the 21^{st} year.

   [4]

   (d) We solve $100 \times 10^{kn} = 100 \times (1.02)^n$. This reduces to:

   $$10^{kn} = (1.02)^n.$$

   We again take logs on both sides to obtain:

   $$kn \log_{10} 10 = n \log_{10} 1.02.$$

   Rearranging yields:

   $$k = \log_{10} 1.02$$

   [4]