

4.

In this question you must show all stages of your working.
Solutions relying entirely on calculator technology are not acceptable.

(i) Given that

$$y = a^x \quad \text{where } a \text{ is a positive constant}$$

express, in simplest form, in terms of y and a

$$(a) \ a^{3x+1} \quad (1)$$

$$(b) \ \frac{5}{(3a^{1-x})^{-2}} \quad (3)$$

(ii) (a) Use the substitution $p = 9^t$ to show that the equation

$$3(3^{4t+2} + 1) = 82 \times 9^t$$

can be rewritten as

$$27p^2 - 82p + 3 = 0 \quad (2)$$

(b) Hence solve

$$3(3^{4t+2} + 1) = 82 \times 9^t \quad (3)$$

2. Given

$$\frac{3^x}{3^{4y}} = 27\sqrt{3}$$

find y as a simplified function of x .

(3)

blank

2. Given that

$$a = \frac{1}{64}x^2 \quad b = \frac{16}{\sqrt{x}}$$

express each of the following in the form kx^n where k and n are simplified constants.

$$(a) \ a^{\frac{1}{2}} \quad (1)$$

$$(b) \ \frac{16}{b^3} \quad (1)$$

$$(c) \ \left(\frac{ab}{2}\right)^{-\frac{4}{3}} \quad (2)$$

2. (i) Given that $m = 2^n$, express each of the following in simplest form in terms of m .

(a) 2^{n+3}

(1)

(b) 16^{3n}

(2)

(ii) **In this question you must show all stages of your working.**

Solutions relying on calculator technology are not acceptable.

Solve the equation

$$x\sqrt{3} - 3 = x + \sqrt{3}$$

giving your answer in the form $p + q\sqrt{3}$ where p and q are integers.

(3)

4. **In this question you must show all stages of your working.**

Solutions relying on calculator technology are not acceptable.

(i) Using the laws of indices, solve

$$2^{4k-3} = \frac{8^{1-k}}{4\sqrt{2}}$$

(3)

(ii) Solve the equation

$$\frac{x\sqrt{3} + 2}{\sqrt{3} - 1} = x\sqrt{3} - 4$$

giving the answer in the form $a + b\sqrt{3}$, where a and b are rational numbers.

(4)

6. **In this question you must show all stages of your working.**

Solutions relying on calculator technology are not acceptable.

(a) Expand and simplify

$$\left(r - \frac{1}{r}\right)^2$$

(2)

(b) Express $\frac{1}{3 + 2\sqrt{2}}$ in the form $p + q\sqrt{2}$ where p and q are integers.

(2)

(c) Use the results of parts (a) and (b), or otherwise, to show that

$$\sqrt{3 + 2\sqrt{2}} - \frac{1}{\sqrt{3 + 2\sqrt{2}}} = 2$$

(3)

2. Given $y = 3^x$, express each of the following in terms of y . Write each expression in its simplest form.

(a) 3^{3x}

(1)

(b) $\frac{1}{3^{x-2}}$

(2)

(c) $\frac{81}{9^{2-3x}}$

(2)