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PURE MATHS

Algebra and Functions

Level & Board	EDEXCEL (A-LEVEL)
TOPIC:	SURDS AND INDICES
PAPER TYPE:	SOLUTION -1
TOTAL QUESTIONS	8
TOTAL MARKS	40

Surds and indices 1 (Solution)

Q1.

First, let's rewrite the equation

$$\frac{(2^x)^2}{2} - 3(2^x) + 4 = 0$$

Let $2^x = y$

$$\frac{y^2}{2} - 3y + 4 = 0$$

Multiply by 2

$$y^2 - 6y + 8 = 0$$

Factorize

$$y^2 - 2y - 4y + 8 = 0$$
$$y(y-2) - 4(y-2) = 0$$
$$y - 0 \quad ; \quad y = 0$$

So $x = 2 \quad ; \quad x = 1$

Hence the solution to the given equation are x = 2 and x = 1

Q2 .

(a) Identify the two errors made by the student.

First error is 2^{2x}

Second error is -8

(b) Find the exact solution to the equation.

$$2^{2x} - 9(2^x) = 0$$

Let $2^x = y$

$$y^2 - 9y = 0$$
$$y(y-9) = 0$$
$$y = 0 \quad ; \quad y = 9$$

So,

Hence, the exact solution is y = 0 and y = 9

Q3.

(i) $2^x = \frac{1}{2^3}$

So, we can rewrite the equation as:

$\Rightarrow \quad 2^x = 2^{-3}$

$\Rightarrow \quad x = -3$

(ii)

$2.(2^x)^2 - 5(2^x) + 2 = 0$

Let $y = 2^x$

$2y^2 - 5y + 2 = 0$

$2y^2 - y - 4y + 2 = 0$

$y(2y - 1) - 2(2y - 1) = 0$

$y = 2 \quad , \quad y = {}^1/_2$

But $2^x = 2 \quad , \quad 2^x = {}^1/_2$

$x = 1 \quad , \quad x = -1$

So, solution to be equation are $x = 1$ and $x = -1$

Q4.

$2^{2x+1} - 6(2^x) + 4 = 0$

$(2^x)^2.2 - 6(2^x) + 4 = 0$

Let $y = 2^x$

$2y - 6y + 4 = 0$

Factorize $2y^2 - 2y - 4y + 4 = 0$

$2y(y - 1) - 4(y - 1) = 0$

$(2y - 4)(y - 1) = 0$

$y = \frac{1}{2} \quad , \quad y = 1$

But $2^x = \frac{1}{2} \quad , \quad 2^x = 1$

$x = -1 \quad , \quad x = 0$

So, the solutions to the original equation are $x = -1$ and $x = 0$

I am Sorry !!!!

Q5.

(i)

Step 1: Rewrite 16 as a power of 2

$$2\,x = \frac{1}{2^{-4}}$$

$$2\,x = 2^{-4}$$

Step 2: Since the bases are same

$$x = -4$$

So, the solution to the equation $x = -4$

(ii)

Step 1: Rewrite the equation

$$43x - 2 = \frac{1}{2^{2+\frac{1}{2}}}$$

$$2^{6x-4} = 2^{-\frac{5}{2}}$$

$$\Longrightarrow \quad 6x - 4 = -\frac{5}{2}$$

$$\Longrightarrow \quad 6x = -\frac{5}{2} + 4$$

$$\Longrightarrow \quad 6x = \frac{-5+8}{2}$$

$$\Longrightarrow \quad x = \frac{1}{4}$$

So, the solution to the equation $4^{3x-2} = \frac{1}{4\sqrt{2}}$ is x = $\frac{1}{4}$

Q6.

(i)

Dividing by 2

$16/2\ a^2 = \sqrt{a}$

$8a^2 = \sqrt{a}$

Square on both sides $64a^4 = a$

$64a^4 - a = 0$

$a(64a^3 - 1) = 0$

$a = 0 \quad , \quad 64a^3 - 1 = 0$

$$, \quad a^3 = \frac{1}{64}$$

$$, \quad a^3 = \frac{1}{4^3}$$

Taking cube root on $, \quad a = \frac{1}{4}$

So, the solutions to the equation are $a = 0, \ and \ \ a = -2$

(ii)

$$(b^2)^2 + 6b^2 - 27 = 0$$

Let $y = b^2$ $\quad y^2 + 6y - 27 = 0$

$$y^2 + 9y - 3y - 27 = 0$$

$$y(y + 9) - 3(y + 9) = 0$$

$$(y - 3)(y + 9) = 0$$

$$y = 3 \quad , \quad y = -9$$

But $\quad b^2 = 3 \quad , \quad b^2 = -9$

$\Longrightarrow \quad b = \pm\sqrt{3} \quad , \quad b = \pm 3i$

So, the solution to the original equation are ± $\sqrt{3}$ and ± 3i.

Q7.

First, simplify the denominator. Since 9 is equal to 3^2, we can rewrite it as:

$$\frac{3^{x-1}}{3^{2(-y-2)}} = 27$$

$$\frac{3^{x-1}}{3^{-2y-4}} = 27$$

$$3^{x-1+2y+4} = 3^3$$

Since the base are same, we can equate the exponents:

$$\Longrightarrow \quad x - 1 + 2y + 4 = 3$$

$$\Longrightarrow \quad x + 2y + 3 = 3$$

$$\Longrightarrow \quad x + 2y = 0$$

$$\Longrightarrow \quad y = \frac{-x}{2}$$

This is the simplest form of the expression for y in terms of x.

Q8.

First, let's simplify the equation, So, we can rewrite it as:

$$2^x \times 2^{2y} = \frac{1}{2^2}$$

$$2^{x+2y} = \frac{1}{2^2}$$

$$2^{x+2y} = 2^{-2}$$

Since, the base are same, we can equate the exponents.

$$x + 2y = -2$$

$$2y = -x - 2$$

$$y = \frac{-(x+2)}{2}$$

This is the simplest form of the expression for y as function of x.