Write 8 as a power of 2 $\rightarrow 2^3$

Write 27 " " " " 3 $\rightarrow 3^3$

Write 16^2 " " " " 2 $\rightarrow (2^4)^2 = 2^8$

An exponential equation has a power with an exponent variable eg. $2^x = 8$

When powers with the same base are equal then their exponents are equal.

ex.1 $2^x = 8$ $\rightarrow$ change 8 to base 2

$2^x = 2^3$ $\rightarrow$ since the bases are the same THEN the exponents are equal

$\boxed{x = 3}$

ex.2. $4^x = 256$

$4^x = 4^4$

$\boxed{x = 4}$

3. $4^x = \frac{1}{8}$ 4 & 8 must be same base "2"

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

$2^{2x} = 2^{-3}$ same base

$2x = -3$

$x = -\frac{3}{2}$

4. $27^x = 9^{2x-1}$

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

1. $a^1 = 1$

$(3^3)^x = (3^2)^{(2x-1)}$

$3^{3x} = 3^{4x-2}$ bases same then exponents equal

$3x = 4x - 2$

$+2 \quad -3x \qquad -3x \quad +2$

$\boxed{2 = x}$

REMEMBER $\sqrt{x} = x^{\frac{1}{2}}$ $\qquad \sqrt[3]{8} = 8^{\frac{1}{3}}$

ex. 5 $2^x = \sqrt[3]{2}$

$2^x = 2^{\frac{1}{3}}$ bases = exp =

$\boxed{x = \frac{1}{3}}$

6. $2^x = 8\sqrt{2}$

$2^x = 2^3 2^{\frac{1}{2}}$ exp law $3 + \frac{1}{2} = 3\frac{1}{2}$ or $\frac{7}{2}$

$2^x = 2^{3\frac{1}{2}}$

$x = 3\frac{1}{2}$ OR $\frac{7}{2}$

7. $\left(\sqrt{125}\right)^{2x+1} = \sqrt[3]{625}$

$\left(\sqrt{5^3}\right)^{2x+1} = \sqrt[3]{5^4}$

$\left((5^3)^{\frac{1}{2}}\right)^{2x+1} = (5^4)^{\frac{1}{3}}$

$\left(5^{\frac{3}{2}}\right)^{(2x+1)}$

$3x + \frac{3}{2} \quad - \quad 5^{\frac{4}{3}}$ base =

$5^{3x+\frac{3}{2}} = 5^{\frac{4}{3}}$ (4/3 moved down)

base =

exp =

$3x+\frac{3}{2} = \frac{4}{3}$

$-\frac{3}{2} \quad -\frac{3}{2}$

$\frac{8}{6} - \frac{9}{6} = -\frac{1}{6}$

$\frac{3x}{3} = -\frac{1}{6} \div 3$

$x = -\frac{1}{6} \times \frac{1}{3} = \boxed{-\frac{1}{18}}$

8. $\left(\frac{1}{9}\right)^x = 3\sqrt{27}$

$\left(\frac{1}{3^2}\right)^x = 3^1\sqrt{3^3}$

$\left(3^{-2}\right)^x = 3\left(3^{\frac{3}{2}}\right)^{\frac{1}{2}}$

$3^{-2x} = 3^1\left(3^{\frac{3}{2}}\right)$

$\frac{2}{2} + \frac{3}{2} = \frac{5}{2}$

$3^{-2x} = 3^{\frac{5}{2}}$

$\frac{-2x}{-2} = \frac{5}{2} \div -2$

$\boxed{x = -\frac{5}{4}}$

REALITY QUESTIONS

Compound interest

$\ldots nt$ $\quad A$ = final amount $\$$

Compound interest

$$A = A_0\left(1 + \frac{i}{n}\right)^{nt}$$

A = final amount $

A_0 = money invested $

i = interest rate

n = compounding periods

t = time in years.

Exponential — Growth → form → $y = ak^{bx}$

— Decay

growth $k^b > 1$, $k > 0$

decay $0 < k^b < 1$

$a, b \in R$

ex. Principal of $\$1500$ (A_0) invested at 4% quarterly. When will it be $\$2500$? ($A$)

$i = 0.04$, $4 = n$

$$A = A_0\left(1 + \frac{i}{n}\right)^{nt}$$

$$2500 = 1500\left(1 + \frac{0.04}{4}\right)^{4t}$$

use the g.c. enter $y_1 = 1500\left(1 + \frac{0.04}{4}\right)^{4x} - 2500$

and find the X-INTERCEPT

approx → $t = 12.83$ yrs

p 415 # 3-6, 9, 10 (choose 4), 12
Tuesday