

C12 - 7.2 - Separate/Factoring/Solving Exponents Notes

Solve for x

$$4^x - 4^{x-1} - 24 = 0$$

$$4^x - \frac{4^x}{4^1} - 24 = 0$$

$$\left(4^x - \frac{4^x}{4^1} - 24 = 0\right) \times 4$$

$$4(4^x) - 4^x - 96 = 0 \quad \text{let } m = 4^x$$

$$4m - m - 96 = 0$$

$$3m = 96$$

$$m = 32$$

$$4^x = 32$$

$$(2^2)^x = 2^5$$

$$2^{2x} = 2^5$$

$$2x = 5$$

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

$$4^x - 4^{x-1} - 24 = 0$$

$$4^{\left(\frac{5}{2}\right)} - 4^{\left(\frac{5}{2}\right)-1} - 24 = 0$$

$$32 - 8 - 24 = 0 \quad \checkmark$$

$$3^x - 3 = 4(3^{-x}) \quad 3^{-x} = \frac{1}{3^x}$$

$$3^x - 3 = \frac{4}{3^x}$$

$$m - 3 = \frac{4}{m} \quad \text{let } m = 3^x$$

$$\left(m - 3 = \frac{4}{m}\right) \times m$$

$$m^2 - 3m = 4$$

$$m^2 - 3m - 4 = 0$$

$$(m - 4)(m + 1) = 0$$

$$m - 4 = 0 \quad m + 1 = 0$$

$$m = 4 \quad m = -1$$

$$3^x = 4 \quad 3^x = -1$$

$$x = 1.2619 \quad \text{No Solution}$$

Calc $y_1 = y_2$

$$3^x - 3 = \frac{4}{3^x}$$

$$3^{1.2619} - 3 = \frac{4}{3^{1.2619}}$$

$$4 - 3 = \frac{4}{4}$$

$$1 = 1 \quad \checkmark$$

$$4^x + 4^{1-x} = 5$$

$$4^x + 4(4^{-x}) = 5$$

$$4^x + \frac{4}{4^x} = 5$$

$$\text{Let } m = 4^x \quad m + \frac{4}{m} = 5$$

$$\left(m + \frac{4}{m} = 5\right) \times m$$

$$m^2 + 4 = 5m$$

$$m^2 + 4 = 5m$$

$$m^2 - 5m + 4 = 0$$

$$(m - 1)(m - 4) = 0$$

$$m - 1 = 0 \quad m - 4 = 0$$

$$m = 1 \quad m = 4$$

$$4^x = 1 \quad 4^x = 4$$

$$4^x = 4^0 \quad 4^x = 4^1$$

$$x = 0 \quad x = 1$$

$$4^x + 4^{1-x} = 5 \quad 4^x + 4^{1-x} = 5$$

$$4^0 + 4^{1-0} = 5 \quad 4^1 + 4^{1-1} = 5$$

$$1 + 4 = 5 \quad 4 + 1 = 5$$

$$5 = 5 \quad 5 = 5 \quad \checkmark \quad \checkmark$$

$$2(2^x)^2 - 3(2^x) + 1 = 0$$

$$2m^2 - 3m + 1 = 0 \quad \text{let } m = 2^x$$

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

$$2m - 1 = 0 \quad m - 1 = 0$$

$$m = \frac{1}{2} \quad m = 1$$

$$2^x = \frac{1}{2} \quad 2^x = 2^0$$

$$2^x = 2^{-1} \quad x = 0$$

$$x = -1$$

$$2(2^x)^2 - 3(2^x) + 1 = 0 \quad 2(2^x)^2 - 3(2^x) + 1 = 0$$

$$2(2^{-1})^2 - 3(2^{-1}) + 1 = 0 \quad 2(2^0)^2 - 3(2^0) + 1 = 0$$

$$2\left(\frac{1}{2}\right)^2 - 3\left(\frac{1}{2}\right) + 1 = 0 \quad 2(1)^2 - 3(1) + 1 = 0$$

$$2\left(\frac{1}{4}\right) - \frac{3}{2} + 1 = 0 \quad 2 - 3 + 1 = 0$$

$$0 = 0 \quad 0 = 0 \quad \checkmark \quad \checkmark$$