ECUACIONES DE PRIMER GRADO

Problema 65:

Resolver el sistema:

$$\frac{x}{11}=\frac{1}{1+\frac{1}{y+\frac{1}{1+\frac{1}{3}}}}$$

$$\frac{x}{19}=\frac{1}{2+\frac{1}{y+\frac{1}{2+\frac{1}{2}}}}$$

Solución Problema 65:

Operando, para simplificar, en la primera ecuación tenemos:

$$\frac{x}{11}=\frac{1}{1+\frac{1}{y+\frac{1}{1+\frac{1}{3}}}}$$

$$\frac{x}{11}=\frac{1}{1+\frac{1}{y+\frac{1}{1+\frac{1}{3}}}}=\frac{1}{1+\frac{1}{y+\frac{1}{\frac{4}{3}}}}=\frac{1}{1+\frac{1}{y+\frac{3}{4}}}=\frac{1}{1+\frac{1}{\frac{4y+3}{4}}}=$$

$$\frac{1}{\frac{4y+7}{4y+3}}=\frac{4y+3}{4y+7}$$

$$\frac{x}{11}=\frac{4y+3}{4y+7}\ \text{ecuación 1}$$

Operando, para simplificar, en la segunda ecuación tenemos:

$$\frac{x}{19} = \frac{1}{2 + \frac{1}{y + \frac{1}{2 + \frac{1}{2}}}}$$

$$\frac{x}{19} = \frac{1}{2 + \frac{1}{y + \frac{1}{2 + \frac{1}{2}}}} = \frac{1}{2 + \frac{1}{y + \frac{1}{\frac{5}{2}}}} = \frac{1}{2 + \frac{1}{y + \frac{2}{5}}} = \frac{1}{2 + \frac{1}{\frac{5y + 2}{5}}}$$

$$\frac{1}{2 + \frac{5}{5y + 2}} = \frac{1}{\frac{10y + 9}{5y + 2}} = \frac{5y + 2}{10y + 9}$$

$$\frac{x}{19} = \frac{5y + 2}{10y + 9} \text{ ecuación 2}$$

Luego las ecuaciones finales son:

$$\frac{x}{11} = \frac{4y + 3}{4y + 7} \text{ ecuación 1}$$

$$\frac{x}{19} = \frac{5y + 2}{10y + 9} \text{ ecuación 2}$$

Despejando x en las dos ecuaciones tenemos

$$x = \frac{11(4y + 3)}{4y + 7}$$

$$x = \frac{19(5y + 2)}{10y + 9}$$

Igualando ambas

$$\frac{11(4y + 3)}{4y + 7} = \frac{19(5y + 2)}{10y + 9}$$

$$11(4y + 3)(10y + 9) = 19(5y + 2)(4y + 7)$$

$11(40y^2 + 30y + 36y + 27) = 19(20y^2 + 8y + 35y + 14)$

$11(40y^2 + 66y + 27) = 19(20y^2 + 43y + 14)$

Simplificando tenemos:

$60y^2 - 91y + 31 = 0$

$$y = \frac{91 \pm \sqrt{91^2 - 4x60x31}}{2x60} = \frac{91 \pm \sqrt{8281 - 7440}}{120} =$$

$$\frac{91 \pm \sqrt{8281 - 7440}}{120} = \frac{91 \pm \sqrt{841}}{120} = \frac{91 \pm 29}{120}$$

$$\boldsymbol{y_1} = \frac{91 + 29}{120} = \frac{120}{120} = \textbf{1 solución válida}$$

$$\boldsymbol{y_2} = \frac{91 - 29}{120} = \frac{62}{120} = \frac{31}{60} \textbf{ no es válida}$$

Para y=1

$$\mathbf{x} = \frac{11(4y + 3)}{4y + 7} = \frac{11(4.1 + 3)}{4.1 + 7} = \mathbf{11}$$

La solución es:

x=7

y=1