

10350 Solving Equations Quiz

1. Solve the equations.

$$1a. \frac{4}{x} = \frac{x}{25} \Rightarrow 25x \cdot \frac{4}{x} = \frac{x}{25} \cdot 25x$$

$$\Rightarrow 25 \cdot 4 = x^2 \Rightarrow x^2 = 100$$

$$\Rightarrow x = \pm \sqrt{100} = 10, -10$$

$$1b. y(y-2) = 3 \Rightarrow y^2 - 2y = 3$$

$$\Rightarrow y^2 - 2y - 3 = 0 \Rightarrow (y-3)(y+1) = 0$$

$$\Rightarrow y = 3, -1$$

$$1c. 10 - 3(y-4) = 7y$$

$$10 - 3y + 12 = 7y$$

$$22 = 7y + 3y$$

$$22 = 10y$$

$$y = \frac{22}{10} = \frac{11}{5}$$

2. Solve for x at the intersections of the curves

$$y = \frac{6}{x} \quad \text{and} \quad y = \frac{5}{x+2} + 1$$

$$\frac{6}{x} = \frac{5}{x+2} + 1$$

$$= \frac{5 + (x+2)}{x+2} = \frac{x+7}{x+2}$$

$$\Rightarrow \frac{6}{x} = \frac{x+7}{x+2} \Rightarrow 6(x+2) = x(x+7)$$

$$\Rightarrow 6x + 12 = x^2 + 7x$$

$$\Rightarrow x^2 + 7x - 6x - 12 = 0$$

$$\Rightarrow x^2 + x - 12 = 0$$

$$\Rightarrow (x+4)(x-3) = 0$$

$$\Rightarrow x = -4, 3.$$

3. Solve the following simultaneous equations.

3a.

$$\begin{aligned} 3x - 2y = -5 & \text{ --- } \textcircled{1} \\ 2x + 3y = 1 & \text{ --- } \textcircled{2} \end{aligned}$$

$$\begin{aligned} 3 \times \textcircled{1} & \therefore 9x - 6y = -15 \\ 2 \times \textcircled{2} & \therefore +) 4x - 6y = 2 \end{aligned}$$

$$\hline 13x = -13$$

$$x = -1$$

$$\begin{aligned} x = -1 \text{ into } \textcircled{1} & \therefore -3 - 2y = -5 \Rightarrow -2y = -5 + 3 \\ & \Rightarrow y = \frac{-2}{-2} = 1 \end{aligned}$$

$$\boxed{(-1, 1)}$$

3b.

$$\begin{aligned} y = 2x & \text{ --- } \textcircled{1} \\ -3x + y^2 = 1 & \text{ --- } \textcircled{2} \end{aligned}$$

Substitute $\textcircled{1}$ into $\textcircled{2}$:

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

$$4x^2 - 3x = 1$$

$$4x^2 - 3x - 1 = 0$$

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

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

$$\begin{aligned} \text{Using } \textcircled{2}: \quad y &= -\frac{1}{4}(2) \quad ; \quad y = 1(2) \\ &= -\frac{1}{2} \quad \quad \quad = 2 \end{aligned}$$

$$\left(-\frac{1}{4}, -\frac{1}{2}\right) \text{ and } (1, 2)$$

4. Find x in the following equations:

$$4a. 3 \cdot 2^x = 24 \Rightarrow 2^x = 24/3 = 8$$

$$\Rightarrow 2^x = 2^3 \Rightarrow x = 3$$

$$4b. 3 \cdot (x+1)^{11} = 24 \Rightarrow (x+1)^{11} = 24/3 = 8$$

$$x+1 = 8^{1/11} \Rightarrow x = -1 + 8^{1/11}$$

$$\text{or } -1 + \sqrt[11]{8}$$

$$4c. 3 \cdot 2^x = 12 \cdot 4^x \Rightarrow 3 \cdot 2^x = 12 \cdot 2^{2x}$$

$$\Rightarrow \frac{3}{12} = \frac{2^{2x}}{2^x} \Rightarrow \frac{1}{4} = 2^x$$

$$\Rightarrow 2^x = \frac{1}{2^2} = 2^{-2} \Rightarrow x = -2$$

5. Find x in terms of all other variables:

$$5a. c = \frac{x^3 - p}{h+1} \Rightarrow c(h+1) = x^3 - p$$

$$\Rightarrow x^3 = p + c(h+1)$$

$$\Rightarrow x = \sqrt[3]{p + c(h+1)}$$

$$5b. y = \frac{x-a}{x+b} \Rightarrow y(x+b) = x-a$$

$$\Rightarrow xy + by = x - a$$

$$\Rightarrow xy - x = -a - by$$

$$\Rightarrow x(y-1) = -a - by$$

$$\Rightarrow x = \frac{-a - by}{y - 1} \text{ or } \frac{a + by}{1 - y}$$