



Questions

1.

i. Solve for  $x$ :

$$2(4 - 3x) + 12 = 7x - 5(2x - 7).$$

ii. Verify your answer to (i) above.

2. Solve the simultaneous equations:

$$\begin{aligned}x + y &= 7 \\x^2 + y^2 &= 25\end{aligned}$$

3.

Simplify  $\frac{x^2 - xy}{x^2 - y^2}$ .

4.

Express the following as a single fraction in its simplest form:

$$\frac{6y}{x(x+4y)} - \frac{3}{2x}$$

5.

Solve the simultaneous equations:

$$\begin{aligned}x^2 + xy + 2y^2 &= 4 \\2x + 3y &= -1.\end{aligned}$$

6.

Express the following as a single fraction in its simplest form:

$$\frac{x^2 + 4}{x^2 - 4} - \frac{x}{x + 2}$$

**Hint:**  $x^2 - 4$  is the difference between two squares i.e.  $(x)^2 - (2)^2 = (x + 2)(x - 2)$

7.

Find the range of values of  $x$  for which  $|x - 4| \geq 2$ , where  $x \in \mathbb{R}$ .

8.

Find the set of all real values of  $x$  for which  $2x^2 + x - 15 \geq 0$ .



9.

Solve the equation  $x = \sqrt{x+6}$   $x \in \mathbb{R}$

*Hint: Try the method of guessing factors  $(x + ?)(x + ?)$  but if this isn't working use the formula:*

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

10. Solve the following for  $x$ ,  $y$  and  $z$ .

$$x + 2y - z = 1$$

$$2x + y + z = 4$$

$$x + 2y + z = 2$$

11. Solve the equation

$$|4x - 3| > 5$$

12. Solve the following equation and graph the solutions.

$$|3x + 2| < 4$$

13. Solve the following cubic equation and graph the results.

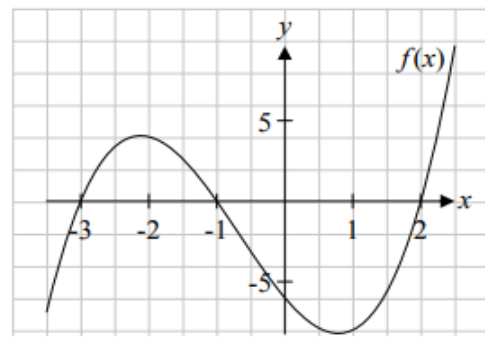
$$f(x) = 2x^3 - 4x^2 - 22x + 24$$

14.

- (a) The graph of a cubic function  $f(x)$  cuts the  $x$ -axis at  $x = -3$ ,  $x = -1$  and  $x = 2$ , and the  $y$ -axis at  $(0, -6)$ , as shown.

Verify that  $f(x)$  can be written as

$$f(x) = x^3 + 2x^2 - 5x - 6.$$



- (b) (i) The graph of the function  $g(x) = -2x - 6$  intersects the graph of the function  $f(x)$  above. Let  $f(x) = g(x)$  and solve the resulting equation to find the co-ordinates of the points where the graphs of  $f(x)$  and  $g(x)$  intersect.
- (ii) Draw the graph of the function  $g(x) = -2x - 6$  on the diagram above.



15.

(i) Let  $f(x) = x^3 + kx^2 - 4x - 12$ , where  $k$  is a constant.

Given that  $x + 3$  is a factor of  $f(x)$ , find the value of  $k$ .

(ii) Show that

$$\frac{3}{1+x^p} + \frac{3}{1+x^{-p}} \text{ simplifies to a constant.}$$

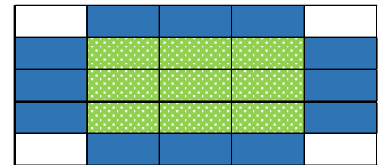
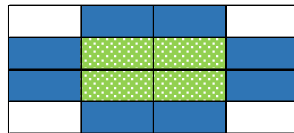
16.


Mary is interested in having the following tile pattern for her kitchen floor.

Stage 1

Stage 2

Stage 3



Green 

Blue 

White 

- Write an expression for the total number of tiles in the  $x^{\text{th}}$  stage of the pattern.
- If there are 324 tiles in total in a pattern, how many green tiles are there?
- Mary's kitchen area measures  $6.76 \text{ m}^2$ . The side of each square tile is 20 cm long. Find the number of each colour of tile that needs to be ordered.

**[Link to SAI website for Maths Tutorial Material](https://web.actuaries.ie/students/maths-tutorials-higher-level-leaving-certificate-20212022)**

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**[Link to SAI Instagram](https://www.instagram.com/saimathstutorials?r=nametag)**

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