## 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:

$$x + y = 7$$
$$x^2 + y^2 = 25$$

3.

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

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:

$$x^2 + xy + 2y^2 = 4$$
$$2x + 3y = -1.$$

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 $x = \sqrt{x + 6}$   $x \in R$

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

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

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.

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

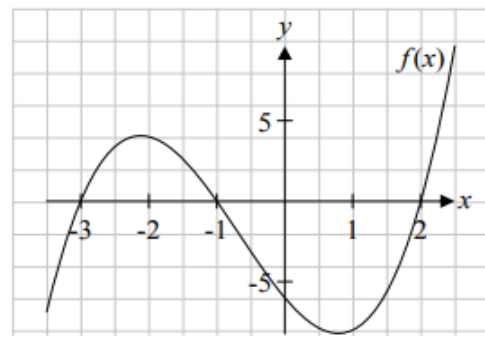13.    Solve the following cubic equation and graph the results.

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

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

$$\frac{3}{1 + x^p} + \frac{3}{1 + x^{-p}} \quad \text{simplifies to a constant.}$$
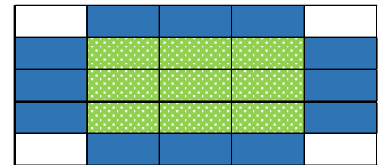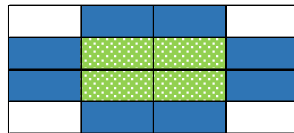
16.

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

| Stage 1 | Stage 2 | Stage 3 |



Green 

Blue 

White 

i)   Write an expression for the total number of tiles in the $x^{th}$ stage of the pattern.
ii)  If there are 324 tiles in total in a pattern, how many green tiles are there?
iii) Mary's kitchen area measures 6·76 m². 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-20222023

**Link to SAI Instagram**
https://www.instagram.com/saimathsturorials?r=nametag