



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.

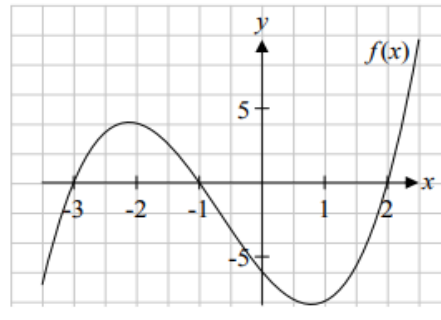
$$f(x) = 2x^3 - 4x^2 - 22x + 24$$

- 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

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



Recent Exam Questions:

1. **2024 Paper 1 Question 1**

- (a) Solve the following equation for $n \in \mathbb{N}$:

$$n - 3 = \sqrt{3n + 1}$$

- (b) Write the following expression as a single fraction in terms of t :

$$\frac{4}{2t + 1} - \frac{7}{12t}$$

- (c) Solve the following simultaneous equations for $x, y, w \in \mathbb{Z}$:

$$x + 2y = 143$$

$$y + 3w = -74$$

$$4x + 5w = 4$$

2. **2022 Paper 1 Question 1**

- (a) Find the two values of $m \in \mathbb{Z}$ for which the following equation in x has exactly **one** solution:

$$3x^2 - mx + 3 = 0$$

- (b) Explain why the following equation in x has **no** real solutions:

$$(2x + 3)^2 + 7 = 0$$

- (c) (i) Show that $x = -1$ is **not** a solution of $3x^2 + 2x + 5 = 0$.

- (ii) Find the **remainder** when $3x^2 + 2x + 5$ is divided by $x + 1$.

That is, find the value of c when $3x^2 + 2x + 5$ is written in the form

$$3x^2 + 2x + 5 = (x + 1)(ax + b) + c$$

where $a, b, c \in \mathbb{Z}$.

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