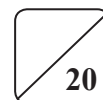


Revision Test 1

Duration: 40 minutes



- 1 What should be the range of m if $\frac{x^2 - x + 1}{x^2 + x - 1} = m$ has no real roots? [6]

- 2 Without using a calculator, find the value of x for $4^2 \times 5^{x-2} = 10^{x-2}$. [3]

- 3 The function $f(x) = ax^3 + bx - 1$, where a and b are constants, is exactly divisible by $x - 1$ and leaves a remainder of -21 when divided by $x + 2$. Find the real root(s) of $f(x) = 0$. [7]

- 4 Solve the simultaneous equations. [4]

$$xy + \frac{5x}{y} = 45$$

$$2xy + \frac{x}{y} = 54$$

Solutions to Revision Test 1

1

$$\frac{x^2 - x + 1}{x^2 + x - 1} = m$$

$$x^2 - x + 1 = mx^2 + mx - m$$

$$(1 - m)x^2 - (1 + m)x + (1 + m) = 0$$

For the given equation to have no real roots,

$$b^2 - 4ac < 0$$

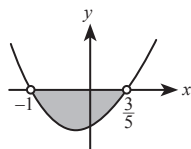
$$[-(1 + m)]^2 - 4(1 - m)(1 + m) < 0$$

$$1 + 2m + m^2 - 4(1 - m^2) < 0$$

$$1 + 2m + m^2 - 4 + 4m^2 < 0$$

$$5m^2 + 2m - 3 < 0$$

$$(5m - 3)(m + 1) < 0$$



$$\therefore -1 < m < \frac{3}{5}$$

2

$$4^2 \times 5^{x-2} = 10^{x-2}$$

$$\frac{4^2 \cdot 5^x}{5^2} = \frac{10^x}{10^2}$$

$$\frac{4^2 \times 10^2}{5^2} = \frac{10^x}{5^x}$$

$$64 = 2^x$$

$$2^6 = 2^x$$

$$x = 6$$

3

$$f(1) = 0$$

$$a + b - 1 = 0$$

$$a + b = 1 \quad \dots\dots (1)$$

$$f(-2) = -21$$

$$-8a - 2b - 1 = -21$$

$$8a + 2b = 20 \quad \dots\dots (2)$$

$$(1) \times 2: \quad 2a + 2b = 2 \quad \dots\dots (3)$$

$$(2) - (3): \quad 6a = 18$$

$$a = 3$$

$$\text{Sub } a = 3 \text{ into (1): } 3 + b = 1$$

$$b = -2$$

$$\therefore f(x) = 3x^3 - 2x - 1$$

By inspection,

$$(x-1)(3x^2+3x+1) = 0 \quad \text{or} \quad (x-1)(3x^2+3x+1) = 0$$

$$\text{When } x - 1 = 0,$$

$$x = 1$$

$$\text{When } 3x^2 + 3x + 1 = 0,$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(3)(1)}}{2(3)}$$

$$b^2 - 4ac = 3^2 - 12$$

$$= -3 < 0$$

$\Rightarrow 3x^2 + 3x + 1 = 0$ has no real root.

$$\therefore x = 1$$

4

$$xy + \frac{5x}{y} = 45 \quad \dots\dots (1)$$

$$2xy + \frac{x}{y} = 54 \quad \dots\dots (2)$$

$$(1) \times 2: \quad 2xy + \frac{10x}{y} = 90 \quad \dots\dots (3)$$

$$(3) - (2): \quad \frac{9x}{y} = 36$$

$$\frac{x}{y} = 4$$

$$x = 4y \quad \dots\dots (4)$$

$$\text{Sub (4) into (1): } 4y^2 + 20 = 45$$

$$4y^2 = 25$$

$$y^2 = \frac{25}{4}$$

$$y = \pm \frac{5}{2}$$

$$\text{When } y = \frac{5}{2}, x = 4\left(\frac{5}{2}\right) = 10$$

$$\text{When } y = -\frac{5}{2}, x = 4\left(-\frac{5}{2}\right) = -10$$

$$\therefore x = 10, y = \frac{5}{2} \text{ or } x = -10, y = -\frac{5}{2}$$

Adapted:

O-Level Additional Mathematics Mock Examinations

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