

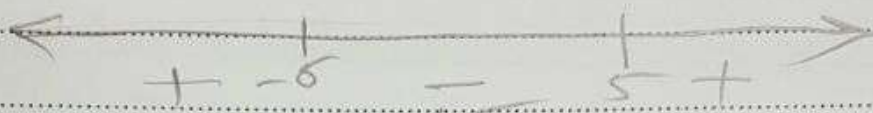
e) Solve  $x^2 + x + 5 < 35$

$$x^2 + x + 5 - 35 < 0$$

$$\Rightarrow x^2 + x - 30 < 0$$

First, we solve the equation  $x^2 + x - 30 = 0 \Rightarrow x = -6$

or  $x = 5$



$\therefore$  The solution set is  $(-6, 5)$ .

**25 MARKS**

Q.4) a) Given  $f(x) = \begin{cases} x^2 & x \leq -1 \\ x^2 - 2 & -2 > x > -1 \\ x^2 + 1 & x \geq 2 \end{cases}$ ,

find

(1)  $f(2)$

(2)  $f(\sqrt{8})$

(3)  $3f(-1) + 2$

(4)  $f(2) - f(0)$

**7**

①  $f(2) = 2^2 + 1 = 5$

②  $f(\sqrt{8}) = (\sqrt{8})^2 + 1 = 9$

③  $3f(-1) + 2 = 3(-1)^2 + 2 = 5$

④  $f(2) - f(0) = (2^2 + 1) - (0^2 - 2) = 7$

Question 4 continues on the next page...

b) Solve  $x^3 + 3x^2 - 4x - 12 = 0$

$$\Rightarrow x^2(x+3) - 4(x+3) = 0$$

$$\Rightarrow (x^2 - 4)(x+3) = 0$$

$$\Rightarrow (x-2)(x+2)(x+3) = 0$$

$$\therefore x = 2, \quad x = -2 \text{ or } x = -3$$

Then, the solution is 2, -2, -3.

c) Solve  $x^{\frac{2}{5}} - 3x^{\frac{1}{5}} + 2 = 0$

$$\text{Let } u = x^{\frac{1}{5}}$$

$$\Rightarrow u^2 - 3u + 2 = 0$$

$$\Rightarrow (u-2)(u-1) = 0$$

$$\Rightarrow u-2=0 \quad \text{or} \quad u-1=0$$

$$\Rightarrow u=2 \quad \text{or} \quad u=1$$

$$\Rightarrow x^{\frac{1}{5}} = 2 \quad \text{or} \quad x^{\frac{1}{5}} = 1$$

$$\Rightarrow x = 2^5 \quad \text{or} \quad x = 1^5$$

$$\therefore x = 32 \quad \text{or} \quad x = 1$$

Then, the solution is 32, 1.

d) Solve  $\sqrt{36x - 80} = 2x$

$$\Rightarrow (\sqrt{36x - 80})^2 = (2x)^2$$

$$\Rightarrow 36x - 80 = 4x^2$$

$$\Rightarrow 4x^2 - 36x + 80 = 0$$

$$\Rightarrow 4(x^2 - 9x + 20) = 0$$

$$\Rightarrow (x - 5)(x - 4) = 0$$

$$\Rightarrow x = 5 \text{ or } x = 4$$

∴ the solution is 5, 4.

**20 MARKS**

Q.3) a) Solve  $|6x - 15| \geq 3$

$$|6x - 15| \geq 3$$

$$\Rightarrow 6x - 15 \geq 3 \quad \text{or} \quad 6x - 15 \leq -3$$

$$\Rightarrow 6x \geq 18 \quad \text{or} \quad 6x \leq 12$$

$$\Rightarrow x \geq 3 \quad \text{or} \quad x \leq 2$$

∴ The solution set is  $\{x | x \geq 3\} \cup \{x | x \leq 2\}$

$$= (-\infty, 2] \cup [3, \infty)$$

Question 3 continues on the next page...

d) Use the quadratic formula to solve

$$x^2 - 3x - 5 = 0$$

$$a = 1, b = -3, c = -5$$

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

$$= \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-5)}}{2(1)} = \frac{3 \pm \sqrt{29}}{2}$$

$$\therefore x = \frac{3 - \sqrt{29}}{2} \quad \text{or} \quad x = \frac{3 + \sqrt{29}}{2}$$

**20 MARKS**

Q.2) a) Solve the following rational equation

$$\frac{9}{r-3} + 2 = \frac{3r}{r-3}$$

$$\Rightarrow \frac{9}{r-3} + \frac{2(r-3)}{r-3} = \frac{3r}{r-3}$$

$$\Rightarrow \frac{9 + 2r - 6}{r-3} = \frac{3r}{r-3}$$

$$\Rightarrow 2r + 3 = 3r$$

$$\Rightarrow r = 3$$

There is no solution, because the equation is undefined at  $r = 3$ .

Question 2 continues on the next page...

Q.1) a) Solve  $x^2 + 15x - 16 = 0$  by factoring.

$$x^2 + 15x - 16 = 0$$

$$\Rightarrow (x+16)(x-1) = 0$$

$$\Rightarrow x+16=0 \text{ or } x-1=0$$

$$\Rightarrow \boxed{x = -16} \text{ or } \boxed{x = 1}$$

5

b) Solve  $x^2 + 4x = 5$  by completing the square.

$$x^2 + 4x = 5 \Rightarrow x^2 + 4x + 2^2 = 5 + 2^2$$

$$\Rightarrow (x+2)^2 = 9$$

$$\Rightarrow x+2 = \pm\sqrt{9} = \pm 3$$

$$\Rightarrow x = -2 - 3 \text{ or } x = -2 + 3 \Rightarrow \boxed{x = -5} \text{ or } \boxed{x = 1}$$

5

c) Solve  $5(x-2)^2 - 40 = 5$

Method 1e  $5(x-2)^2 - 40 = 5$

$$\Rightarrow 5(x^2 - 4x + 4) - 40 = 5$$

$$\Rightarrow 5x^2 - 20x + 20 - 40 = 5$$

$$\Rightarrow 5x^2 - 20x - 25 = 0$$

$$\Rightarrow 5(x^2 - 4x - 5) = 0$$

$$\Rightarrow (x-5)(x+1) = 0$$

$$\Rightarrow \boxed{x = 5} \text{ or } \boxed{x = -1}$$

Method 2e

$$5(x-2)^2 - 40 = 5$$

$$\Rightarrow (x-2)^2 = \frac{45}{5}$$

$$\Rightarrow x-2 = \pm\sqrt{9}$$

$$\Rightarrow x = 2 \pm 3$$

$$\Rightarrow \boxed{x = -1} \text{ or } \boxed{x = 5}$$

5

b) Solve

$$4(5 - 3x) \geq 2(x - 4)$$

$$\Rightarrow 20 - 12x \geq 2x - 8$$

$$\Rightarrow -12x - 2x \geq -8 - 20$$

$$\Rightarrow -14x \geq -28$$

$$\Rightarrow x \leq \frac{-28}{-14}$$

$$\Rightarrow x \leq 2 \quad \therefore \text{The solution set is } \{x | x \leq 2\}$$

c) Solve  $0 \leq 6x - 2 \leq 20$ 

$$\Rightarrow 2 \leq 6x \leq 20 + 2$$

$$\Rightarrow \frac{2}{6} \leq x \leq \frac{22}{6}$$

$$\Rightarrow \frac{1}{3} \leq x \leq \frac{11}{3}$$

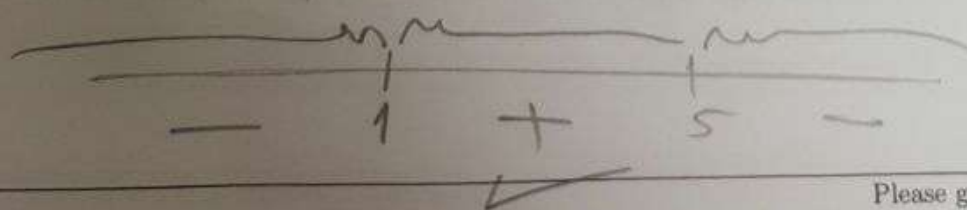
$$\therefore \text{The solution set is } \left[\frac{1}{3}, \frac{11}{3}\right]$$

d) Solve  $\frac{3x+1}{x-1} \geq 4$ 

$$\Rightarrow \frac{3x+1}{x-1} - 4 \geq 0$$

$$\Rightarrow \frac{(3x+1) - 4(x-1)}{x-1} \geq 0$$

$$\Rightarrow \frac{-x+5}{x-1} \geq 0 \quad \therefore \text{The solution set is } \{x | 1 < x \leq 5\}$$



Please go on to the next page.