

1. Solve for x . Graph the solution set on the number line.

[K 4]

$$\frac{x}{3} < \frac{x+1}{2} \leq 1$$

$$\frac{x}{3} < \frac{x+1}{2} \quad \text{and} \quad \frac{x+1}{2} \leq 1$$

$$2x < 3x+3 \quad \text{and} \quad x+1 \leq 2$$

$$x > -3 \quad \text{and} \quad x \leq 1$$

$$\therefore -3 < x \leq 1$$

$$x \in (-3, 1]$$



2. Solve for x .

[A 4]

$$x(x^2 - 1) = (x+1)^2 - 4$$

$$x^3 - x = x^2 + 2x + 1 - 4$$

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

$$x^2(x-1) - 3(x-1) = 0$$

$$(x-1)(x^2-3) = 0$$

$$\therefore x = 1, \pm\sqrt{3}$$

3. Solve for x . Graph the solution set on the number line.

[T 4]

$$x^3 + 1 \geq 3(x^2 - 1)$$

$$x^3 + 1 \geq 3x^2 - 3$$

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

$$\{\pm 1, \pm 2, \pm 4\}$$

$$P(1) = 2 \neq 0$$

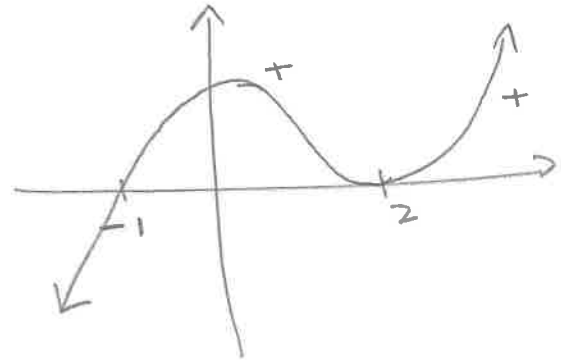
$$P(-1) = -1 - 3 + 4 = 0$$

$$\begin{array}{r|rrrr} -1 & 1 & -3 & 0 & 4 \\ & 0 & -1 & 4 & -4 \\ \hline & 1 & -4 & 4 & 0 \end{array}$$

$$x^2 - 4x + 4 = 0$$

$$(x-2)^2 = 0$$

$$(x+1)(x-2)^2 \geq 0$$



$$\therefore x \geq -1$$



4. Explain why the following inequality has only one real solution. Find this solution.

[C 3]

~~$$x^6 + x^4 + x^2 = 0$$~~

$$x^6 + x^4 + x^2 \leq 0$$

x^2 , x^4 , and x^6 are positive or 0

$x^6 + x^4 + x^2$ can't be negative

$$x^6 + x^4 + x^2 = 0 \text{ at } x = 0$$

$$\therefore x = 0$$

$$x^4 + 7x^2 + 2 \leq 4x^3 + 6x$$

$$(x-1)^2 \underbrace{(x^2 - 2x + 2)}_{>0} \leq 0$$

$$(x-1)^2 \leq 0$$

$$(x-1)^2 \geq 0$$

$$\therefore x = 1$$