Exercise 4.2

(1)(i) $x^2 - 3x - 10 = 0$

LHS

$x^2 - 3x - 10$

$\Rightarrow x^2 - 5x + 2x - 10$

$\Rightarrow x(x-5) + 2(x-5)$

$\Rightarrow (x-5)(x+2)$

∴ The roots of this equation $x^2 - 3x - 10 = 0$ are the values of x for which $(x-5)(x+2) = 0$

Therefore,

$x - 5 = 0$ $\qquad$ $x + 2 = 0$

$\Rightarrow x = 5$ $\qquad$ $\Rightarrow x = -2$.

(ii) $2x^2 + x - 6 = 0$

LHS

$2x^2 + x - 6$

$\Rightarrow 2x^2 + 4x - 3x - 6$

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

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

∴ The roots of this equation $2x^2 + x - 6 = 0$ are the values of x for which $(x+2)(2x-3) = 0$.

Therefore,

$x+2=0$ $\qquad$ $2x-3=0$

$\Rightarrow x=2$ $\qquad$ $\Rightarrow x=\frac{3}{2}$.

(iii) $\sqrt{2}x^2+7x+5\sqrt{2}=0$

LHS

$\sqrt{2}x^2+7x+5\sqrt{2}$

$\Rightarrow \sqrt{2}x^2+5x+2x+5\sqrt{2}$

$\Rightarrow x(\sqrt{2}x+5)+\sqrt{2}(\sqrt{2}x+5)$

$\Rightarrow (\sqrt{2}x+5)(x+\sqrt{2})$

∴ The roots of this equation $\sqrt{2}x^2+7x+5\sqrt{2}=0$ are the values of x for which $(\sqrt{2}x+5)(x+\sqrt{2})=0$

Therefore,

$\sqrt{2}x+5=0$ $\qquad$ $x+\sqrt{2}=0$

$\Rightarrow x=\frac{-5}{\sqrt{2}}$ $\qquad$ $\Rightarrow x=-\sqrt{2}$.

(iv) $2x^2-x+\frac{1}{8}=0$

LHS

$2x^2-x+\frac{1}{8}$

$\Rightarrow \frac{1}{8}(16x^2-8x+1)$

$\Rightarrow \frac{1}{8}(16x^2-4x-4x+1)$

$\Rightarrow \frac{1}{8}[4x(4x-1)-1(4x-1)]$

$= \frac{1}{8}(4x-1)^2$

$\therefore$ The roots of the equation $2x^2 - x + \frac{1}{8} = 0$ are the values of x for which $(4x-1)^2 = 0$

Therefore,

$4x - 1 = 0$
$\Rightarrow x = \frac{1}{4}$

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(v) $100x^2 - 20x + 1 = 0$

LHS

$100x^2 - 20x + 1$
$\Rightarrow 100x^2 - 10x - 10x + 1$
$\Rightarrow 10x(10x-1) - 1(10x-1)$
$\Rightarrow (10x-1)(10x-1)$
$\Rightarrow (10x-1)^2$

$\therefore$ The roots of the equation $100x^2 - 20x + 1 = 0$ are the values of x for which $(10x-1)^2 = 0$

Therefore,

$10x - 1 = 0$
$\Rightarrow x = \frac{1}{10}$

$10x - 1 = 0$
$\Rightarrow x = \frac{1}{10}$.