

90 mins

ACHA 3000

2nd November

2011093

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1) Simplify;

(i) $x^4 \cdot x^6 \cdot x \Rightarrow x^4 \cdot x^6 \cdot x^1 \Rightarrow x^{4+6+1} \Rightarrow x^{11}$

(ii) $2x^2 \cdot 3x^3 \cdot 2x \Rightarrow 12x^2 \cdot x^3 \cdot x^1 \Rightarrow 12x^{2+3+1} \Rightarrow 12x^6$

(iii) $\frac{x^4 \cdot x^3 \cdot x^2}{x^9} \Rightarrow \frac{x^{4+3+2}}{x^9} = \frac{x^9}{x^9} = 1$

(iv) $(3x^2)^3 \Rightarrow 3x^6$

(v) $\sqrt{x} \cdot \sqrt{x} \Rightarrow (\sqrt{x})^2 = (x^{\frac{1}{2}})^2 = x^1 = x$

2) Solve;

(i) $15x - 2 = 12x + 9$
 $15x - 12x = 9 + 2$
 $3x = 11$
 $x = \frac{11}{3}$

(ii) $3(4x - 1) = 6(x + 3)$

$21x - 3 = 6x + 18$

$21x - 6x = 18 + 3$

$15x = 21$

$x = \frac{21}{15} = \frac{7}{5}$

(iii) $\frac{5x+3}{4} = \frac{2x-1}{9}$

$45x + 27 = 8x - 4$

$45x - 8x = -4 - 27$

$37x = -31$

$x = -\frac{31}{37}$

3) Solve;

(i) $x^2 + 10x + 21 = 0$
 $\begin{array}{r} x \quad \times \quad +7 \\ x \quad \times \quad +3 \\ \hline \end{array}$
 $(x+7)(x+3) = 0$
 $x_1 = -7 \quad x_2 = -3$

(ii) $x^2 - 3x + 2 = 0$
 $\begin{array}{r} x \quad \times \quad -2 \\ x \quad \times \quad -1 \\ \hline \end{array}$
 $(x-2)(x-1) = 0$
 $x_1 = 2 \quad x_2 = 1$

(iii) $x^2 + 12x + 20 = 0$
 $\begin{array}{r} x \quad \quad +10 \\ x \quad \quad +2 \\ \hline \end{array}$
 $(x+10)(x+2) = 0$
 $x_1 = -10 \quad x_2 = -2$

(iv) $x^2 - 64 = 0$
 $x^2 = 64 \quad 8^2 = 64$
 $x = \pm 8$
 $x_1 = -8$
 $x_2 = 8$

(v) $2x^2 + 9x + 10 = 0$
 $\begin{array}{r} 2x \quad \times \quad +2 \\ x \quad \times \quad +5 \\ \hline \end{array}$
 $(2x+5)(x+2) = 0$
 $x_1 = -\frac{5}{2} \quad x_2 = -2$

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$$4) \frac{-b \pm \sqrt{b^2 - 4ac}}{2a};$$

$$14x^2 + 3x = 11$$

$$14x^2 + 3x - 11 = 0$$

(a) (b) (c)

$$x = \frac{-3 \pm \sqrt{3^2 - 4 \cdot 14 \cdot (-11)}}{2 \cdot 14}$$

$$x = \frac{-3 \pm \sqrt{9 + 616}}{28} \quad \sqrt{625} = 25$$

$$x = \frac{-3 \pm \sqrt{625}}{28}$$

$$x_1 = \frac{-3 + 25}{28}$$

$$x_2 = \frac{-3 - 25}{28}$$

$$x_1 = \frac{11}{14}$$

$$x_2 = -1$$

$$5) \quad 5x + 3y = 39 \quad (x2)$$

$$8x - 2y = 42 \quad (x3)$$

$$\downarrow$$

$$10x + 6y = 78$$

$$24x - 6y = 126$$

$$34x = 204$$

$$x = \frac{204}{34}$$

$$x = 6$$

$$7 \quad 5 \cdot (6) + 3y = 39$$

$$30 + 3y = 39$$

$$3y = 39 - 30$$

$$3y = 9$$

$$y = 3$$

$$\left(\begin{array}{l} 30 + 9 = 39 \checkmark \\ (5 \cdot 6) + (3 \cdot 3) = 39 \\ (8 \cdot 6) - (2 \cdot 3) = 42 \\ 48 - 6 = 42 \checkmark \end{array} \right)$$

6) Simplify,

$$5(2x^2 - y^2) - x^2(x^2 - y) - x^2y - x^4$$

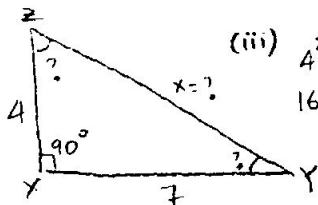
$$(10x^2 - 5y^2)$$

$$(-x^4 + x^2y)$$

$$10x^2 - 5y^2 - x^4 + \cancel{x^2y} - \cancel{x^2y} - x^4$$

$$10x^2 - 5y^2 - 2x^4$$

7)



$$(iii) \quad 4^2 + 7^2 = x^2$$

$$16 + 49 = x^2$$

$$65 = x^2$$

$$x = \sqrt{65} \approx 8.062$$

$$8) \quad (i) \quad 3\sqrt{x}$$

$$\Rightarrow 3\sqrt{x} = x^{\frac{1}{2}}$$

$$(ii) \quad 1$$

$$x^0 = 1$$

(i) Angle Y

$$\tan Y = \frac{4}{7}$$

$$Y = \tan^{-1}\left(\frac{4}{7}\right)$$

$$Y = 29.7^\circ \approx 30.0^\circ$$

(ii) Angle Z

$$\text{Angle } X = 90^\circ$$

$$\text{Angle } Y = 29.7^\circ$$

$$\Rightarrow 90^\circ + 29.7^\circ + Z^\circ = 180^\circ$$

$$Z^\circ = 60.3$$