PS # 6 Solutions

1i $(x-3)(2x+7)=0$

$x-3=0$ AND $2x+7=0$

$\boxed{x=3}$ $\quad 2x=-7$

$\boxed{x=\frac{-7}{2}}$

1ii $x^2-3x=0 \quad x(x-3)=0$

$\boxed{x=0}$ AND $x-3=0$

$\boxed{x=3}$

1iii $x^2+8x=-7 \quad x^2+8x+7=0$

$(x+7)(x+1)=0$

$(x+7)=0 \quad x+1=0$

$\boxed{x=-7}$ AND $\boxed{x=-1}$

1iv $2x^2-x=3 \quad 2x-x-3=0$

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

$2x-3=0 \quad x+1=0$

$2x=3$ AND

$\boxed{x=\frac{3}{2}}$ $\quad \boxed{x=-1}$

1v $x(2x+4)=5x+1 \quad 2x^2+4x=5x+1$

$2x^2-x-1=0$

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

$2x+1=0 \quad x-1=0$

$2x=-1$

$\boxed{x=-\frac{1}{2}}$ AND $\boxed{x=1}$

1vi $3(x^2-6x+5)=2(-2x^2+2x+1)+x^2-5x+8$

$3x^2-18x+15=-4x^2+4x+2+x^2-5x+8$

$3x^2-18x+15=-3x^2-x+10$

$6x^2-17x+5=0 \Rightarrow 6x^2-2x-15x+5=0$

$2x(3x-1)-5(3x-1)=0$

$(3x-1)(2x-5)=0$

$3x-1=0 \quad 2x-5=0$

$3x=1 \quad 2x=5$

$\boxed{x=1/3}$ AND $\boxed{x=5/2}$

2i $x^2+8x+5=0$

$x^2+8x+\underline{16}=-5+16$

$\sqrt{(x+4)^2}=\sqrt{9}$

$x+4=\pm 3$

$8=2ab$, $a=1$, $b=4$, $b^2=16$

$x+4=3$ AND $x+4=-3$

$\boxed{x=-1}$ $\quad \boxed{x=-7}$

2ii $x^2-6x-4=0$

$x^2-6x+\underline{9}=4+\underline{9}$

$\sqrt{(x-3)^2}=\sqrt{13}$

$x-3=\pm\sqrt{13}$

$-6=2ab$, $a=1$, $b=-3$, $b^2=9$

$x-3=\sqrt{3}$

$\boxed{x=3+\sqrt{13}}$

AND

$x-3=-\sqrt{13}$

$\boxed{x=3-\sqrt{13}}$

2iii $5x^2+10x+___=-7$

$\frac{5(x^2+2x+___)}{5}=\frac{-7}{5}$

$x^2+2x+\underline{1}=-7/5+\underline{1}$

$2=2ab$, $a=1$, $b=1$, $b^2=1$

$(x+1)^2=-\frac{7}{5}+\frac{5}{5}$

$\sqrt{(x+1)^2}=\sqrt{-\frac{2}{5}}$

$x+1=\pm\sqrt{\frac{2}{5}}\,i$ AND $x+1=-\sqrt{\frac{2}{5}}\,i$

$x+1=\sqrt{\frac{2}{5}}\,i$

$\boxed{x=-1+\sqrt{\frac{2}{5}}\,i}$ $\quad \boxed{x=-1-\sqrt{\frac{2}{5}}\,i}$

2iv $x^2-10x-6=0$

$x^2-10x+\underline{25}=6+\underline{25}$

$\sqrt{(x-5)^2}=\sqrt{31}$

$x-5=\pm\sqrt{31}$

$-10=2ab$, $a=1$, $b=-5$, $b^2=25$

AND

$x-5=\sqrt{31}$ $\quad x-5=-\sqrt{31}$

$\boxed{x=5+\sqrt{31}}$ $\quad \boxed{x=5-\sqrt{31}}$

2v $x^2=3x+12$

$x^2-3x+\frac{9}{4}=12+\frac{9}{4}$

$2ab=-3$, $a=1$, $b=-\frac{3}{2}$, $b^2=\frac{9}{4}$

$\left(x-\frac{3}{2}\right)^2=\frac{48}{4}+\frac{9}{4}$ $\quad \sqrt{\left(x-\frac{3}{2}\right)^2}=\sqrt{\frac{57}{4}}$

$x-\frac{3}{2}=\pm\sqrt{\frac{57}{4}}$

AND

$x-\frac{3}{2}=\frac{1}{2}\sqrt{57}$ $\quad \boxed{x=\frac{3}{2}+\frac{\sqrt{57}}{2}}$ $\quad x-\frac{3}{2}=-\frac{\sqrt{57}}{2}$ $\quad \boxed{x=\frac{3}{2}-\frac{\sqrt{57}}{2}}$

PS 6 (continued

(3i) $x^2 - 8x + 2 = 0$

$a = 1 \quad b = -8 \quad c = 2$

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

$$x = \frac{8 \pm \sqrt{64 - 8}}{2}$$

$$x = \frac{8 \pm \sqrt{56}}{2} = \frac{8 \pm \sqrt{4 \cdot 14}}{2} = \frac{8 \pm 2\sqrt{14}}{2}$$

$\boxed{x = 4 + \sqrt{14}}$ AND $\boxed{x = 4 - \sqrt{14}}$

(3ii) $11x^2 + 2x - 1 = 0$

$a = 11 \quad b = 2 \quad c = -1$

$$x = \frac{-(2) \pm \sqrt{(2)^2 - 4(11)(-1)}}{2(11)}$$

$$x = \frac{-2 \pm \sqrt{4 + 44}}{22} = \frac{-2 \pm \sqrt{48}}{22}$$

$$x = \frac{-2 \pm \sqrt{16 \cdot 3}}{22} = \frac{-2 \pm 4\sqrt{3}}{22}$$

$\boxed{x = -\frac{1}{11} + \frac{2\sqrt{3}}{11}}$ AND $\boxed{x = -\frac{1}{11} - \frac{2\sqrt{3}}{11}}$

(3iii) $x^2 - 9x + 21 = 8 \quad x^2 - 9x + 13 = 0$

$a = 1 \quad b = -9 \quad c = 13$

$$x = \frac{-(-9) \pm \sqrt{(-9)^2 - 4(1)(13)}}{2(1)}$$

$$x = \frac{9 \pm \sqrt{81 - 52}}{2} = \frac{9 \pm \sqrt{29}}{2}$$

$\boxed{x = \frac{9}{2} + \frac{\sqrt{29}}{2}}$ AND $\boxed{x = \frac{9 - \sqrt{29}}{2}}$

(3iv) $-(1 + x) = -x^2 \quad -1 - x = -x^2$

$x^2 - x - 1 = 0$

$a = 1 \quad b = -1 \quad c = -1$

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

$$x = \frac{1 \pm \sqrt{1 + 4}}{2} = \frac{1 \pm \sqrt{5}}{2}$$

$\boxed{x = \frac{1}{2} + \frac{\sqrt{5}}{2}}$ AND $\boxed{x = \frac{1}{2} - \frac{\sqrt{5}}{2}}$

(3v) $-10x^2 - 8x = x^2 - 3x - 20$

$0 = 11x^2 + 5x - 20$

$a = 11 \quad b = 5 \quad c = -20$

$$x = \frac{-(5) \pm \sqrt{(5)^2 - 4(11)(-20)}}{2(11)}$$

$$x = \frac{-5 \pm \sqrt{25 + 880}}{22} = \frac{-5 \pm \sqrt{905}}{22}$$

$$x = \frac{-5 \pm \sqrt{81 \cdot 5}}{22} = \frac{-5 \pm \sqrt{905}}{22}$$

$\boxed{x = \frac{-5}{22} + \frac{\sqrt{905}}{22}}$ AND $\boxed{x = \frac{-5}{22} - \frac{\sqrt{905}}{22}}$

(4i) $\frac{4 \cdot \cancel{(x-5)}}{\cancel{x-5}} = 3 \cdot (x-5) \quad 4 = 3(x-5)$

$4 = 3x - 15$
$+15 \quad +15$

$19 = 3x \quad \boxed{x = \frac{19}{3}}$

(4ii) $\frac{5 \cdot (x-2)}{\cancel{3x+8}} = \frac{3}{\cancel{x-2}} \cdot \cancel{(3x+8)} \cdot \cancel{(x-2)}$

$5(x-2) = 3(3x+8)$

$5x - 10 = 9x + 24$
$-5x \quad -24 \quad -5x \quad -24$

$-34 = 4x \quad x = \frac{-34}{4} = \boxed{\frac{-17}{2}}$

PS 6 (continued)

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

$\frac{3x}{x} - 5x + 4x^2 = 2x$

$-2x \qquad -2x$

$4x^2 - 7x + 3 = 0$

$a \cdot c = 4 \cdot 3 = 12 \qquad m \cdot n = 12$

$m + n = -7$

$m = -4 \quad n = -3$

$4x^2 - 4x - 3x + 3 = 0$

$4x(x-1) - 3(x-1) = 0$

$(4x-3)(x-1) = 0$

$4x - 3 = 0 \qquad x - 1 = 0$

$4x = 3 \qquad \boxed{x = 1}$

$\boxed{x = \frac{3}{4}}$

4iv $3\sqrt{x+10} + 25 = 16$

$-25 \qquad -25$

$\frac{3\sqrt{x+10}}{3} = \frac{-9}{3}$

$(\sqrt{x+10})^2 = (-3)^2 \qquad x + 10 = 9$

$-10 \quad -10$

$x = -1$ => check your answer!

$3\sqrt{-1+10} + 25 = 16$

$3\sqrt{9} + 25 = 16$

$3 \cdot 3 + \cancel{25} = 16$ => no solution!

4v $\sqrt{x-1} - 2\sqrt{4x+7} = 0$

$(\sqrt{x-1})^2 = (2\sqrt{4x+7})^2$

$x - 1 = 4(4x+7)$

$x - 1 = 16x + 28$

$-x - 28 \qquad -x - 28$

$\frac{-29}{15} = \frac{15x}{15} \qquad x = \frac{-29}{15}$ => check your answer

$\sqrt{-\frac{29}{15} - 1} - 2\sqrt{\frac{-29}{15} \times 4 + 7} = 0$

$\sqrt{\frac{-29}{15} - \frac{15}{15}} - 2\sqrt{\frac{-116}{15} + \frac{105}{15}} = 0$

$\sqrt{\frac{-44}{15}} - 2\sqrt{\frac{-10}{15}}$

$\sqrt{\frac{-44}{15}} - \sqrt{\frac{-40}{15}} \neq 0$ not true

no solution!