

ANSWERS \Rightarrow METHOD 2 - COMPLETING THE SQUARE

15. $x^2 + 6x + 4 = 0$
 $x^2 + 6x = -4$
 $x^2 + 6x + 9 = -4 + 9$
 $x^2 + 6x + 9 = 5$
 $(x + 3)^2 = 5$
 $x + 3 = \pm\sqrt{5}$
 $x = -3 \pm \sqrt{5}$

One solution is $x = -3 + \sqrt{5}$,
the other is $x = -3 - \sqrt{5}$.

By calculator, these roots
are approx. -0.76 and -5.24 .

16. $t^2 + 8t - 7 = 0$
 $t^2 + 8t = 7$
 $t^2 + 8t + 16 = 7 + 16$
 $t^2 + 8t + 16 = 23$
 $(t + 4)^2 = 23$
 $t + 4 = \pm\sqrt{23}$
 $t = -4 \pm \sqrt{23}$

One solution is $-4 + \sqrt{23}$,
the other is $-4 - \sqrt{23}$.

$$17. d^2 = 7d - 9$$

$$d^2 - 7d + 9 = 0$$

$$d^2 - 7d = -9$$

$$d^2 - 7d + \frac{49}{4} = -9 + \frac{49}{4}$$

$$d^2 - 7d + \frac{49}{4} = \frac{-36}{4} + \frac{49}{4}$$

$$d^2 - 7d + \frac{49}{4} = \frac{13}{4}$$

$$\left(d - \frac{7}{2}\right)^2 = \frac{13}{4}$$

$$d - \frac{7}{2} = \pm \sqrt{\frac{13}{4}}$$

$$d = \frac{7}{2} \pm \sqrt{\frac{13}{4}}$$

$$\text{or } d = \frac{7}{2} \pm \frac{\sqrt{13}}{2}$$

One solution
is $\frac{7 + \sqrt{13}}{2}$, the
other is $\frac{7 - \sqrt{13}}{2}$.

$$18. \quad x-3 = -x^2$$

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

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

$$x^2+1x+\frac{1}{4} = 3+\frac{1}{4}$$

$$x^2+1x+\frac{1}{4} = \frac{12}{4}+\frac{1}{4}$$

$$\left(x+\frac{1}{2}\right)^2 = \frac{13}{4}$$

$$x+\frac{1}{2} = \pm \sqrt{\frac{13}{4}}$$

$$x = -\frac{1}{2} \pm \sqrt{\frac{13}{4}}$$

$$\text{or } x = -\frac{1}{2} \pm \frac{\sqrt{13}}{2}$$

One solution is $x = -\frac{1}{2} + \frac{\sqrt{13}}{2}$, the

other is $x = -\frac{1}{2} - \frac{\sqrt{13}}{2}$

$$19. \begin{cases} 2x^2 + 8x + 5 = 0 \\ 2x^2 + 8x = -5 \\ x^2 + 4x = -\frac{5}{2} \end{cases}$$

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

$$x^2 + 4x + 4 = \frac{-5}{2} + \frac{8}{2}$$

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

$$(x+2)^2 = \frac{3}{2}$$

$$x+2 = \pm \sqrt{\frac{3}{2}}$$

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

One solution is
 $x = -2 + \sqrt{\frac{3}{2}}$, the other
is $x = -2 - \sqrt{\frac{3}{2}}$.

$$20. \quad 4t^2 + 10t + 5 = 0$$

$$4t^2 + 10t = -5$$

$$t^2 + \frac{10}{4}t = -\frac{5}{4}$$

$$t^2 + \frac{5}{2}t = -\frac{5}{4} \quad (\text{lowest terms})$$

$$t^2 + \frac{5}{2}t + \frac{25}{4} = -\frac{5}{4} + \frac{25}{4}$$

$$\left(t + \frac{5}{4}\right)^2 = \frac{-20}{16} + \frac{25}{16}$$

$$\left(t + \frac{5}{4}\right)^2 = \frac{5}{16}$$

$$t + \frac{5}{4} = \pm \sqrt{\frac{5}{16}}$$

$$t + \frac{5}{4} = \pm \frac{\sqrt{5}}{4}$$

$$t = -\frac{5}{4} \pm \frac{\sqrt{5}}{4}$$

One solution is
 $t = -\frac{5}{4} + \frac{\sqrt{5}}{4},$

the other is

$$t = -\frac{5}{4} - \frac{\sqrt{5}}{4}.$$

$$21. \quad 6x^2 + 3x - 2 = 0$$

$$6x^2 + 3x = 2$$

$$x^2 + 3x = \frac{2}{6}$$

$$x^2 + \frac{1}{2}x = \frac{1}{3} \quad (\text{lowest terms.})$$

$$x^2 + \frac{1}{2}x + \frac{1}{16} = \frac{1}{3} + \frac{1}{16}$$

$$\left(x + \frac{1}{4}\right)^2 = \frac{16}{48} + \frac{3}{48}$$

$$\left(x + \frac{1}{4}\right)^2 = \frac{19}{48}$$

$$x + \frac{1}{4} = \pm \sqrt{\frac{19}{48}}$$

$$x + \frac{1}{4} = \pm \frac{\sqrt{19}}{\sqrt{16 \times 3}} \quad (\text{Simplifying } \sqrt{48})$$

$$x + \frac{1}{4} = \pm \frac{\sqrt{19}}{4\sqrt{3}}$$

$$x = -\frac{1}{4} \pm \frac{\sqrt{19}}{4\sqrt{3}}$$

One solution is $x = -\frac{1}{4} + \frac{\sqrt{19}}{4\sqrt{3}}$,

the other is $x = -\frac{1}{4} - \frac{\sqrt{19}}{4\sqrt{3}}$.

22. $2x - 6 = -5x^2$ (Rearrange into General Form)

$$5x^2 + 2x - 6 = 0$$

$$5x^2 + 2x = 6$$

$$x^2 + \frac{2x}{5} = \frac{6}{5}$$

$$x^2 + \frac{2x}{5} + \frac{4}{100} = \frac{6}{5} + \frac{4}{100}$$

$$\left(x + \frac{2}{10}\right)^2 = \frac{120}{100} + \frac{4}{100}$$

$$\left(x + \frac{2}{10}\right)^2 = \frac{124}{100}$$

$$x + \frac{2}{10} = \pm \sqrt{\frac{124}{100}}$$

$$x + \frac{2}{10} = \pm \frac{\sqrt{124}}{10}$$

$$x + \frac{2}{10} = \pm \frac{\sqrt{4 \times 31}}{10} \quad (\text{Simplifying } \sqrt{124})$$

$$x + \frac{2}{10} = \pm \frac{2\sqrt{31}}{10}$$

$$x = -\frac{2}{10} \pm \frac{2\sqrt{31}}{10}$$

$$x = -\frac{1}{5} \pm \frac{\sqrt{31}}{5} \quad (\text{lowest terms})$$

One solution is $x = -\frac{1}{5} + \frac{\sqrt{31}}{5}$,

the other solution is $x = -\frac{1}{5} - \frac{\sqrt{31}}{5}$.

$$23. \frac{1}{2}x^2 + x - 13 = 0$$

$$\frac{1}{2}x^2 + x = 13$$

$$x^2 + 2x = 26$$

$$x^2 + 2x + 1 = 26 + 1$$

$$(x+1)^2 = 27$$

$$x+1 = \pm \sqrt{27}$$

$$x = -1 \pm \sqrt{27}$$

$$x = -1 \pm \sqrt{9 \times 3} \quad (\text{Simplifying } \sqrt{27})$$

$$x = -1 \pm 3\sqrt{3}$$

One solution is $-1 + 3\sqrt{3}$,

the other solution is $-1 - 3\sqrt{3}$.