

Solve the following equations for the exact solutions (no decimals) by the completing the square method. Reduce answers as much as possible. When you have completed the assignment and checked your work for accuracy, click the "Submit Assignment" button above to turn in your work. Then click the "Next" button at the bottom of the page to go forward.

1.  $x^2 - 12x + 15 = 0$

$$\begin{aligned} x^2 - 12x &= -15 \\ x^2 - 12x + \frac{36}{2} &= -15 + \frac{36}{2} \\ (x + \frac{b}{2})^2 &= a \end{aligned}$$

$$\begin{aligned} (x-6)^2 &= 21 \\ x-6 &= \pm\sqrt{21} \\ +6 &+6 \\ \boxed{x &= 6 \pm \sqrt{21}} \end{aligned}$$

2.  $x^2 = 6x - 91$

$$\begin{aligned} -6x -6x \\ x^2 - 6x &= -91 \\ x^2 - 6x + 9 &= -91 + 9 \\ (x + \frac{b}{2})^2 &= -82 \end{aligned}$$

$$\begin{aligned} (x-3)^2 &= -82 \\ x-3 &= \pm\sqrt{82}i \\ +3 &+3 \\ \boxed{x &= 3 \pm \sqrt{82}i} \end{aligned}$$

$$\begin{array}{r} \sqrt{82} \\ \wedge \\ 2 \ 41 \end{array}$$

3.  $6x^2 + 12x - 48 = 0$

$$\begin{aligned} 6(x^2 + 2x - 8) &= 0 \\ x^2 + 2x - 8 &= 0 \\ +8 &+8 \\ x^2 + 2x &= 8 \end{aligned}$$

$$\begin{aligned} x^2 + 2x + 1 &= 8 + 1 \\ (x + \frac{b}{2})^2 &= 9 \\ \sqrt{(x+1)^2} &= \sqrt{9} \\ x+1 &= \pm 3 \\ -1 &-1 \end{aligned}$$

$$\begin{aligned} x &= 3 - 1 = 2 \\ x &= -3 - 1 = -4 \end{aligned}$$

4.  $x^2 + 19x = -54$

$$\begin{aligned} x^2 + 19x + \frac{361}{4} &= -54 + \frac{361}{4} \\ (x + \frac{b}{2})^2 &= \frac{145}{4} \\ (x + \frac{19}{2})^2 &= \frac{145}{4} \end{aligned}$$

$$\begin{aligned} (x + \frac{19}{2})^2 &= \frac{145}{4} \\ x + \frac{19}{2} &= \pm\sqrt{\frac{145}{4}} \\ x + \frac{19}{2} &= \pm\frac{\sqrt{145}}{2} \\ -\frac{19}{2} &-\frac{19}{2} \end{aligned}$$

$$\begin{array}{r} \sqrt{145} \\ \wedge \\ 5 \ 29 \end{array}$$

$$\boxed{x = \frac{-19 \pm \sqrt{145}}{2}}$$

5.  $8x^2 - 48x = -40$

$$\begin{aligned} +40 &+40 \\ 8x^2 - 48x + 40 &= 0 \\ 8(x^2 - 6x + 5) &= 0 \\ x^2 - 6x + 5 &= 0 \end{aligned}$$

$$\begin{aligned} (x-3)^2 &= 4 \\ (x-3)^2 &= 4 \\ x-3 &= \pm 2 \\ +3 &+3 \end{aligned}$$

$$\begin{aligned} x &= 2 + 3 = 5 \\ x &= -2 + 3 = 1 \end{aligned}$$

$$\begin{array}{l}
 x^2 - 6x = -5 \\
 x^2 - 6x + 9 = -5 + 9
 \end{array}$$

KEY

1.  $6 \pm \sqrt{21}$
2.  $3 \pm i\sqrt{82}$
3. 2, -4
4.  $\frac{-19 \pm \sqrt{145}}{2}$
5. 5, 1