

Homework 8.7

Math 154B

Completing the Square Worksheet

Name

Key!

To solve $ax^2 + bx + c = 0$ by "completing the square":

- 1) Put the variable terms on the left of the equal sign, in standard form, and the constant term is on the right. So, get it into the form $ax^2 + bx = c$.
- 2) Divide by "a", so the coefficient of x^2 is 1.

3) Take one-half the coefficient of the x-term, squaring it, and adding this quantity to both sides of the equation. Basically, add $\left(\frac{b}{2}\right)^2$ to both sides.

4) Factor the Perfect Square Trinomial on the left side of the equation and simplify the right side. Remember, it always factors into $\left(x + \frac{b}{2}\right)^2$

5) Use the principle of square roots

6) Solve the remaining equation

7) Check your answer in the original equation.

Solve each equation by completing the square.

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

$$x^2 - 2x + \frac{1}{1} = 15 + \frac{1}{1}$$

$$(x-1)^2 = 16$$

$$x-1 = 4 \quad x = 5$$

$$x-1 = \pm 4$$

$$x-1 = -4 \quad x = -3$$

2. $x^2 + 2x = 35$

$$x^2 + 2x + \frac{1}{1} = 35 + \frac{1}{1}$$

$$(x+1)^2 = 36$$

$$x+1 = \pm 6$$

$$x+1 = 6 \quad x = 5$$

$$x+1 = -6 \quad x = -7$$

3. $2x^2 + 8x - 7 = -2$

4. $8x = 4x^2 - 1$

5. $2x^2 - 4x + 5 = 6$

6. $6x = 4x^2 - 1$

7. $x^2 + 2x - 8 = 0$

8. $x^2 - 7x = 18$

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

$$x^2 - 7x + \frac{49}{4} = 18 + \frac{49}{4}$$

$$(x+1)^2 = 9$$

$$(x - 7/2)^2 = 121/4$$

$$x+1 = \pm 3$$

$$x - 7/2 = \pm 11/2$$

$$x+1 = 3$$

$$x+1 = -3$$

$$x - 7/2 = 11/2$$

$$x - 7/2 = -11/2$$

$$x = 2$$

$$x = -4$$

$$x = 9$$

$$x = -2$$

$$9. 3x^2 - 2x - 2 = 4$$

$$10. -7x = 3x^2 - 1$$

$$11. x^2 - 2x - 1 = 2$$

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

$$(x-1)^2 = 4$$

$$x-1 = \pm 2$$

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

$$x = 3 \quad x = -1$$

$$13. x^2 + 4x = 3$$

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

$$(x+2)^2 = 7$$

$$x+2 = \pm \sqrt{7}$$

$$x = -2 \pm \sqrt{7}$$

$$12. x^2 + 3x = 40$$

$$x^2 + 3x + \frac{9}{4} = 40 + \frac{9}{4}$$

$$(x + \frac{3}{2})^2 = \frac{169}{4}$$

$$x + \frac{3}{2} = \pm \frac{13}{2}$$

$$x + \frac{3}{2} = \frac{13}{2} \quad x = 5$$

$$x + \frac{3}{2} = -\frac{13}{2}$$

$$x = -8$$

$$14. 7x = 4x^2 - 1$$

Answers:

$$1. x = -3, x = 5$$

$$2. x = -7, x = 5$$

$$3. x = \frac{-4 + \sqrt{26}}{2}, x = \frac{-4 - \sqrt{26}}{2}$$

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

$$5. x = \frac{2 + \sqrt{6}}{2}, x = \frac{2 - \sqrt{6}}{2}$$

$$6. x = \frac{3 + \sqrt{13}}{4}, x = \frac{3 - \sqrt{13}}{4}$$

$$7. x = -4, x = 2$$

$$8. x = -2, x = 9$$

$$9. x = \frac{1 + \sqrt{19}}{3}, x = \frac{1 - \sqrt{19}}{3}$$

$$10. x = \frac{-7 + \sqrt{61}}{6}, x = \frac{-7 - \sqrt{61}}{6}$$

$$11. x = -1, x = 3$$

$$12. x = -8, x = 5$$

$$13. x = -2 + \sqrt{7}, x = -2 - \sqrt{7}$$

$$14. x = \frac{7 + \sqrt{65}}{8}, x = \frac{7 - \sqrt{65}}{8}$$