## 11.4 Completing the Square

Algebra 1 Name: _____

**Practice**

**State if the following are perfect square trinomials. Show work that justifies your conclusion.**

1. $x^2 + 8x + 16$

$4^2 = 16$

Yes

2. $x^2 - 20x + 50$

$(-10)^2 = 100$

No

3. $x^2 + 7x + \frac{49}{4}$

$\left(\frac{7}{2}\right)^2 = \frac{49}{4}$

Yes

4. $x^2 - 6x + 36$

$(-3)^2 = 9$

NO

**Given a binomial, what constant $c$ should be added to make it a perfect square trinomial? Rewrite this new trinomial as a binomial squared.**

5. $x^2 + 6x$

$c = 9$

binomial squared:

$(x+3)^2$

6. $x^2 - 16x$

$c = 64$

binomial squared:

$(x-8)^2$

7. $x^2 + 11x$

$c = \frac{121}{4}$

binomial squared:

$(x+\frac{11}{2})^2$

8. $x^2 - 3x$

$c = \frac{9}{4}$

binomial squared:

$(x-\frac{3}{2})^2$

9. $x^2 - 8x = -15$

$+16 \quad +16$

$(x-4)^2 = 1$

$x-4 = \pm 1$

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

$\boxed{x=5 \qquad x=3}$

10. $x^2 - 4x = 21$

$+4 \quad +4$

$(x-2)^2 = 25$

$x-2 = \pm 5$

$x-2=5 \qquad x-2=-5$

$\boxed{x=7 \qquad x=-3}$

11. $x^2 + 12x + 20 = 0$

$x^2+12x = -20$

$+36 \quad +36$

$(x+6)^2 = 16$

$x+6 = \pm 4$

$x+6=4 \qquad x+6=-4$

$\boxed{x=-2 \qquad x=-10}$

12. $x^2 + 5x - 5 = -15$

$x^2+5x = -10$

$+\frac{25}{4} \quad +\frac{25}{4}$

$(x+\frac{5}{2})^2 = -\frac{40}{4} + \frac{25}{4}$

$x+\frac{5}{2} = \pm\frac{\sqrt{15}}{4}$

No Solution!

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

$+4 \quad +4$

$(x-2)^2 = 10$

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

$\boxed{x = 2 \pm \sqrt{10}}$

14. $x^2 + 10x = 1$

$+25 \quad +25$

$(x+5)^2 = 26$

$x+5 = \pm\sqrt{26}$

$\boxed{x = -5 \pm \sqrt{26}}$

15. $x^2 - 6x - 10 = 0$

$x^2 - 6x = 10$

$+9 \quad +9$

$(x-3)^2 = 19$

$x-3 = \pm\sqrt{19}$

$\boxed{x = 3 \pm \sqrt{19}}$

16. $x^2 + 14x - 1 = 0$

$x^2+14x = 1$

$+49 \quad +49$

$(x+7)^2 = 50$

$x+7 = \pm\sqrt{25 \cdot 2}$

$\boxed{x = -7 \pm 5\sqrt{2}}$

17. $x^2 - 6x + 3 = 10$

$x^2 - 6x = 7$

$+9 \quad +9$

$(x-3)^2 = 16$

$x-3 = \pm 4$

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

18. $x^2 = 1 - 3x$

$x^2 + 3x = 1$

$+\frac{9}{4} \quad +\frac{9}{4}$

$(x + \frac{3}{2})^2 = \frac{13}{4}$

$x + \frac{3}{2} = \pm\sqrt{\frac{13}{4}}$

$\boxed{x = -\frac{3}{2} \pm \frac{\sqrt{13}}{2}}$

19. $x^2 - 3x + 1 = 5 + 2x$

$x^2 - 5x = 4$

$+\frac{25}{4} \quad +\frac{25}{4}$

$(x - \frac{5}{2})^2 = \frac{16}{4} + \frac{25}{4}$

$x - \frac{5}{2} = \pm\sqrt{\frac{41}{4}}$

$\boxed{x = \frac{5}{2} \pm \frac{\sqrt{41}}{2}}$

20. $x^2 + 5x - 1 = 1 - 4x$

$x^2 + 9x = 2$

$+\frac{81}{4} \quad +\frac{81}{4}$

$(x + \frac{9}{2})^2 = \frac{8}{4} + \frac{81}{4}$

$x + \frac{9}{2} = \pm\sqrt{\frac{89}{4}}$

$\boxed{x = -\frac{9}{2} \pm \frac{\sqrt{89}}{2}}$

21. Find the vertex of
$f(x) = 2x^2 - 4x$

$x = \frac{4}{2(2)} = \frac{4}{4} = 1$

$f(1) = 2(1) - 4(1)$

$= -2$

$\boxed{(1, -2)}$

22. Solve by **factoring**.
$x^2 + 7x = -12$

$x^2 + 7x + 12 = 0$

$(x+3)(x+4) = 0$

$\boxed{x = -3 \quad x = -4}$

23. Use the function to evaluate.

$$f(x) = \begin{cases} -7x + 4x^2, & x \le -3 \\ 8x, & -3 < x \le 3 \\ 7 - x, & x > 3 \end{cases}$$

a. $f(-5) =$ 135 b. $f(0.5) =$ 4

c. $f(0) =$ 0 d. $f(3) =$ 24