

## Solving Equations By Completing the Square

Date \_\_\_\_\_ Period \_\_\_\_\_

Solve each equation by completing the square.

1)  $b^2 + 12b - 42 = 8$

$$b^2 + 12b = 50$$

$$b^2 + 12b + 36 = 86$$

$$\sqrt{(b+6)^2} = \sqrt{86}$$

$$b+6 = \pm\sqrt{86}$$

$$\boxed{b = -6 \pm \sqrt{86}}$$

3)  $v^2 + 16v - 59 = 10$

$$v^2 + 16v = 69$$

$$v^2 + 16v + 64 = 133$$

$$\sqrt{(v+8)^2} = \sqrt{133}$$

$$v+8 = \pm\sqrt{133}$$

$$\boxed{v = -8 \pm \sqrt{133}}$$

5)  $a^2 + 12a + 28 = -4$

$$a^2 + 12a = -32$$

$$a^2 + 12a + 36 = 4$$

$$\sqrt{(a+6)^2} = \sqrt{4}$$

$$a+6 = \pm 2$$

$$\boxed{a = -4, -8}$$

7)  $a^2 + 20a + 75 = 0$

$$a^2 + 20a = -75$$

$$a^2 + 20a + 100 = 25$$

$$\sqrt{(a+10)^2} = \sqrt{25}$$

$$a+10 = \pm 5$$

$$\boxed{a = -5, -15}$$

9)  $x^2 - 14x - 70 = 0$

$$x^2 - 14x = 70$$

$$x^2 - 14x + 49 = 119$$

$$\sqrt{(x-7)^2} = \sqrt{119}$$

$$x-7 = \pm\sqrt{119}$$

$$\boxed{x = 7 \pm \sqrt{119}}$$

11)  $n^2 - 6n - 64 = 0$

$$n^2 - 6n = 64$$

$$n^2 - 6n + 9 = 73$$

$$\sqrt{(n-3)^2} = \sqrt{73}$$

$$n-3 = \pm\sqrt{73}$$

$$\boxed{n = 3 \pm \sqrt{73}}$$

2)  $p^2 + 2p - 65 = -4$

$$p^2 + 2p = 61$$

$$p^2 + 2p + 1 = 62$$

$$\sqrt{(p+1)^2} = \sqrt{62}$$

$$p+1 = \pm\sqrt{62}$$

$$\boxed{p = -1 \pm \sqrt{62}}$$

4)  $m^2 - 12m - 47 = -2$

$$m^2 - 12m = 45$$

$$m^2 - 12m + 36 = 81$$

$$\sqrt{(m-6)^2} = \sqrt{81}$$

$$m-6 = \pm 9$$

$$\boxed{m = 15, -3}$$

6)  $m^2 + 4m - 26 = 6$

$$m^2 + 4m = 32$$

$$m^2 + 4m + 4 = 36$$

$$\sqrt{(m+2)^2} = \sqrt{36}$$

$$m+2 = \pm 6$$

$$\boxed{m = 4, -8}$$

8)  $n^2 - 6n - 56 = 0$

$$n^2 - 6n = 56$$

$$n^2 - 6n + 9 = 65$$

$$\sqrt{(n-3)^2} = \sqrt{65}$$

$$n-3 = \pm\sqrt{65}$$

$$\boxed{n = 3 \pm \sqrt{65}}$$

10)  $k^2 + 8k - 20 = 0$

$$k^2 + 8k = 20$$

$$k^2 + 8k + 16 = 36$$

$$\sqrt{(k+4)^2} = \sqrt{36}$$

$$k+4 = \pm 6$$

$$\boxed{k = 2, -10}$$

12)  $k^2 - 18k + 59 = 0$

$$k^2 - 18k = -59$$

$$k^2 - 18k + 81 = 22$$

$$\sqrt{(k-9)^2} = \sqrt{22}$$

$$k-9 = \pm\sqrt{22}$$

$$\boxed{k = 9 \pm \sqrt{22}}$$

$$13) 8x^2 - 16x - 88 = 7x^2$$

$$x^2 - 16x = 88$$

$$x^2 - 16x + 64 = 152$$

$$\sqrt{(x-8)^2} = \sqrt{152}$$

$$x-8 = \pm 2\sqrt{38}$$

$$\boxed{x = 8 \pm 2\sqrt{38}}$$

$$15) x^2 - 14x - 27 = -8x$$

$$x^2 - 6x = 27$$

$$x^2 - 6x + 9 = 36$$

$$\sqrt{(x-3)^2} = \sqrt{36}$$

$$x-3 = \pm 6$$

$$\boxed{x = 9, -3}$$

$$17) r^2 - 10r - 45 = 4$$

$$r^2 - 10r = 49$$

$$r^2 - 10r + 25 = 74$$

$$\sqrt{(r-5)^2} = \sqrt{74}$$

$$r-5 = \pm \sqrt{74}$$

$$\boxed{r = 5 \pm \sqrt{74}}$$

$$14) -4m^2 + 10m - 71 = 4 - 5m^2$$

$$m^2 + 10m = 75$$

$$m^2 + 10m + 25 = 100$$

$$\sqrt{(m+5)^2} = \sqrt{100}$$

$$m+5 = \pm 10$$

$$\boxed{m = 5, -15}$$

$$16) n^2 + 6n - 15 = 8n$$

$$n^2 - 2n = 15$$

$$n^2 - 2n + 1 = 16$$

$$\sqrt{(n-1)^2} = \sqrt{16}$$

$$n-1 = \pm 4$$

$$\boxed{n = 5, -3}$$

$$18) n^2 - 48 = 2n$$

$$n^2 - 2n = 48$$

$$n^2 - 2n + 1 = 49$$

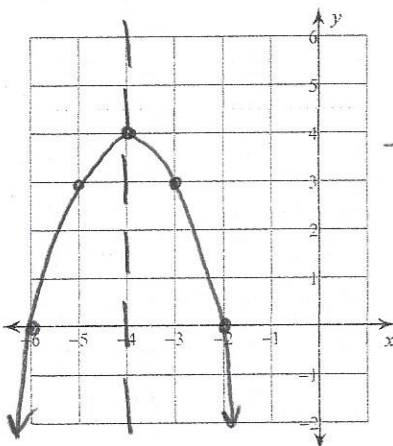
$$\sqrt{(n-1)^2} = \sqrt{49}$$

$$n-1 = \pm 7$$

$$\boxed{n = 8, -6}$$

Sketch the graph of each function.

$$19) y = -x^2 - 8x - 12$$



$$x = \frac{8}{2(-1)} = \frac{8}{-2}$$

$$x = -4$$

$$-1(-4)^2 - 8(-4) - 12$$

$$-16 + 32 - 12$$

$$y = 4$$

$$(-4, 4)$$

$$20) y = (x+2)^2 - 1$$

$$(-2, -1)$$

