

Completing the Square Review

Name: Key

Type 1

a) $x^2 - 14x - 24 = 0$

$$x^2 - 14x + 49 = 24 + 49$$

$$\sqrt{(x-7)^2} = \sqrt{73}$$

$$x-7 = \pm\sqrt{73}$$

$$x = 7 \pm \sqrt{73}$$

$$x = 7 \pm 6\sqrt{2}$$

b) $3m^2 + 6m - 12 = 0$

$$3(m^2 + 2m - 4) = 0$$

$$m^2 + 2m + 1 = 4 + 1$$

$$(m+1)^2 = 5$$

$$m = -1 \pm \sqrt{5}$$

Type 2

$-5 = 2x^2 - 4x$

$$-5 = 2(x^2 - 2x)$$

$$-5 = 2(x^2 - 2x + 1)$$

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

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

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

$$2 \pm \sqrt{\frac{3}{2}}$$

or

$$2 \pm \sqrt{\frac{6}{2}}$$

Type 3

a) $y = x^2 + 6x - 1$

$$y = (x^2 + 6x + 9) - 9 - 1$$

$$y = (x+3)^2 - 10$$

b) $f(x) = 2x^2 - 2 + 8x$

$$y = 2(x^2 + 4x + 4) - 8 - 2$$

$$y = 2(x+2)^2 - 10$$

Find the value of c that makes each trinomial a perfect square.

1. $x^2 - 24x + c$

$$144$$

2. $x^2 + 10x + c$

$$25$$

3. $x^2 - x + c$

$$\frac{1}{4}$$

Solve each equation by completing the square. Reduce your radical if necessary.

5. $b^2 + 12b = 13$

$$(b+6)^2 = 49$$

$$b = -6 \pm 7$$

$$-13 \text{ and } 1$$

6. $x^2 - 30x = -25$

$$(x-15)^2 = 31 + 225$$

$$x = 15 \pm \sqrt{256}$$

$$x = 15 \pm 16$$

$$31 \text{ and } -1$$

$$7. -3n^2 + 3n + 10 = 8$$

$$-3(n^2 - n) = -2$$

$$-3\left(n^2 - n + \frac{1}{4}\right) = -2 - \frac{3}{4}$$

$$-3\left(n - \frac{1}{2}\right)^2 = -\frac{11}{4}$$

$$\sqrt{\left(n - \frac{1}{2}\right)^2} = \pm \sqrt{\frac{11}{12}}$$

$$n = \frac{1}{2} \pm \sqrt{\frac{11}{12}}$$

$$n = \frac{1}{2} \pm \sqrt{\frac{33}{6}}$$

$$10. 3x^2 + 12x - 180 = 0$$

$$x^2 + 4x + 4 = 60 + 4$$

$$(x+2)^2 = 64$$

$$x = -2 \pm 8$$

$$-10 \text{ and } 6$$

$$8. x^2 + 18x - 50 = 9$$

$$(x+9)^2 = 59 + 81$$

$$x = -9 \pm \sqrt{140}$$

$$x = -9 \pm 2\sqrt{35}$$

$$11. 2t^2 - 4t = 46$$

$$t^2 - 2t + 1 = 23 + 1$$

$$(t-1)^2 = 24$$

$$t = 1 \pm 2\sqrt{6}$$

$$9. 3g^2 + 15g - 3 = 0$$

$$g^2 + 5g + 6.25 = 1 + 6.25$$

$$(g+2.5)^2 = 7.25$$

$$g = -2.5 \pm \sqrt{7.25}$$

$$12. 18 = 7x + 4x^2$$

$$18 = 4\left(x^2 + \frac{7}{4}x\right)$$

$$\frac{49}{16} + 18 = 4\left(x^2 + \frac{7}{4}x + \frac{49}{64}\right)$$

$$\frac{337}{16} = 4\left(x + \frac{7}{8}\right)^2$$

$$\sqrt{\frac{337}{64}} = \sqrt{\left(x + \frac{7}{8}\right)^2}$$

$$-\frac{7}{8} \pm \frac{\sqrt{337}}{8}$$

Transform the equation from standard form to vertex form by completing the square.

$$12. g(x) = x^2 - 8x + 11$$

$$g(x) = x^2 - 8x + 16 - 16 + 11$$

$$g(x) = (x-4)^2 - 5$$

$$13. h(x) = 3x^2 + 9x - 5 = 0$$

$$h(x) = 3(x^2 + 3x + 2.25) - 5 - 6.75$$

$$h(x) = 3(x+1.5)^2 - 11.75$$

$$14. y = 2x^2 + 8x - 2$$

$$y = 2[x^2 + 4x - 1]$$

$$y = 2[x^2 + 4x + 4 - 4 - 1]$$

$$y = 2[(x+4)^2 - 5]$$

$$y = 2(x+4)^2 - 10$$