Lesson 4.3

Saturday, February 4, 2017 4:41 PM

PREC 11 **4.3 Solving Quadratic Equations by Completing The Square**

When $b = 0$, the quadratic equation $ax^2 + bx + c = 0$ becomes $ax^2 + c = 0$. If this equation has a solution, it can be solved by using square roots.

Example 1: Solve each equation and verify the solution. (Isolate x)

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

$3x^2 = 15$

$x^2 = 5$

$x = \pm\sqrt{5}$

$x = \sqrt{5}$ or $-\sqrt{5}$

b. $(x+3)^2 = 20$

$x + 3 = \pm\sqrt{20}$

$\sqrt{20} = \sqrt{4}\cdot\sqrt{5} = 2\sqrt{5}$

$x = 2\sqrt{5} - 3$ or $-2\sqrt{5} - 3$

$x = 1.47$ or -7.47

From last day we learned that some quadratic equations can be solved by factoring. However, not all equations can be factored. Therefore, use the strategy of completing the square to try to solve these equations.

Example 2: Solve $x^2 + 4x - 3 = 0$ by completing the square.

No sol'n for $-x- = -3$ or $-+- = 4$

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

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

$(x+2)^2 - 7 = 0$

$(x+2)^2 = 7$

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

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

Example 3: Solve each equation by completing the square:

a. $\frac{1}{2}x^2 + 3x - \frac{9}{2} = 0$

$\frac{1}{2}(x^2 + 6x + 9 - 9) - \frac{9}{2} = 0$

$\frac{1}{2}(x^2 + 6x + 9) - \frac{9}{2} - \frac{9}{2} = 0$

$\frac{1}{2}(x+3)^2 - 9 = 0$

$\frac{1}{2}(x+3)^2 = 9$

$(x+3)^2 = 18$

$x + 3 = \pm\sqrt{18}$

$x + 3 = \pm 3\sqrt{2}$

$x = 3\sqrt{2} - 3$ or $-3\sqrt{2} - 3$

b. $-5x^2 - 10x + 2 = 0$

$-5(x^2 + 2x + 1 - 1) + 2 = 0$

$-5(x^2 + 2x + 1) + 5 + 2 = 0$

$-5(x+1)^2 + 7 = 0$

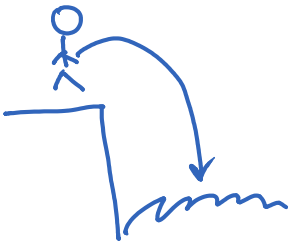
$-5(x+1)^2 = -7$

$(x+1)^2 = \frac{7}{5}$

$x + 1 = \pm\sqrt{\frac{7}{5}}$

$x = \pm\sqrt{\frac{7}{5}} - 1$

Example 4: A person stands on a cliff that is 55 m high. He throws a stone up in the air; the stone hits the water a few seconds later. The approximate height of the stone, h metres, above the water after t seconds is modeled by this formula: $h = 55 + 30t - 5t^2$. When will the stone hit the water? Give the answer to the nearest tenth of a second.



when $h=0$

$0 = 55 + 30t - 5t^2$

$0 = -5t^2 + 30t + 55$

$0 = -5(t^2 - 6t + 9 - 9) + 55$

$0 = -5(t-3)^2 + 100$

$-100 = -5(t-3)^2$

$20 = (t-3)^2$

$t = 2\sqrt{5} + 3$ or $-2\sqrt{5} + 3$ Reject

$t = 2\sqrt{5} + 3$

$= 7.4721$

$= 7.5$ sec

Example 5: When the square of a number is added to the number, the sum is 3. What is the number?

Let x be the #.

$x^2 + x = 3$

$x^2 + x - 3 = 0$

$\left(x^2 + x + \frac{1}{4} - \frac{1}{4}\right) - 3 = 0$

$\left(x + \frac{1}{2}\right)^2 - \frac{13}{4} = 0$

$\left(x + \frac{1}{2}\right)^2 = \frac{13}{4}$

$x + \frac{1}{2} = \pm\sqrt{\frac{13}{4}}$

$x = \pm\sqrt{\frac{13}{4}} - \frac{1}{2}$

$x = \frac{\pm\sqrt{13}}{\sqrt{4}} - \frac{1}{2}$

$x = \frac{\pm\sqrt{13}}{2} - \frac{1}{2}$

$x = \frac{\pm\sqrt{13} - 1}{2}$

Assignment: pg. 240 ~~#1, 3, 4ac, 5ace, 6ace, 7ace, 8, 13~~

HW P.240

#1 ce, 3 ad, 4 ac, 5 ace, 6 ace. 7 ace, 8, 13-15, 18