

MATH 1314 – COLLEGE ALGEBRA
SECTION 2.5 QUADRATIC EQUATIONS

- Quadratic Equation: Can be written in the form $ax^2 + bx + c = 0$ where a, b, c are real numbers and $a \neq 0$
- Zero Factor Theorem: If a and b are real numbers, and if $ab = 0$, then

Ex: Solve (a) $2x^2 + 9x - 35 = 0$.

(b) $6x^3 + 13x^2 - 8x = 0$

- Square Root Property: If $c > 0$, the equation $x^2 = c$ has two real roots:

Ex: (a) Solve $x^2 - 4 = 0$.

(b) Solve $x^2 = 7$.

Ex: (a) Solve $x^2 - 27 = 0$.

(b) Solve $(x - 11)^2 = 4$.

- Completing the Square: $ax^2 + bx + c = 0$ (Remember: a, b, c may be positive, negative, or zero)
 1. If a , the coefficient of x^2 , is not 1, change it to 1 by dividing both sides by a , the current coefficient of x^2 .
 2. Move the constant to the right hand side.
 3. Complete the square on x :
 - (a) Take one-half of the coefficient of x , and then square it. HINT: leave as $\left(\frac{b}{2a}\right)^2$
 - (b) Add this number to both sides of the equation.
 4. Factor the perfect square trinomial. NOTE: It will always be $\left(x + \frac{b}{2a}\right)^2$.
***Keep the sign from 3(a) and combine like terms.
 5. Solve the resulting quadratic equation by square root property.

Ex: Solve by completing the square: $x^2 - 2x - 9 = 0$.

Ex: Solve by completing the square: $2x^2 + 5x = 12$.

- The Quadratic Formula: The solutions of the general quadratic equation $ax^2 + bx + c = 0$ ($a \neq 0$) are

Ex: Use the quadratic formula to solve $4x^2 + 13x + 16 = 0$.

- Discriminant: If a, b , and c are real numbers (and $a \neq 0$), then the discriminant is $b^2 - 4ac$. Used to determine the nature of the roots of an equation of the form $ax^2 + bx + c = 0$.

Discriminant	# and Type of Roots
0	One repeated rational root
Positive and a perfect square	Two different rational roots
Positive and not a perfect square	Two different irrational roots
Negative	No real number roots (Two complex roots)

Ex: Determine the nature of the roots of $10x^2 + x = 21$.

- Pythagorean Theorem: For a right triangle with legs of length a and b and hypotenuse of length c :

Ex: A formula for the normal systolic blood pressure for a man age A , measured in mmHg, is given as $P = 0.006A^2 - 0.02A + 120$. Find the age to the nearest year of a man whose normal blood pressure measures 125 mmHg.