Notes: Solving Quadratic Equations by Factoring

Riddle:

"I am thinking of two numbers, *a* and *b*.
The product of my numbers is zero.
What do you know about my numbers?

Oct 4-8:01 AM

Ex. 1: Solve for *x*.

a. $x(x - 4) = 0$ b. $(x - 4)(2x + 5) = 0$

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Ex. 2: Solve by factoring.

a. $m^2 - 10m = 0$ b. $9x^2 = 49$

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c. $y^2 + 6y = 0$ b. $4b^2 - 8b - 5 = 0$

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e. $x^2 + 2x = 63$ f. $-3r^2 = 7r + 4$

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* $(x - 6)(x + 2) = 48$

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Ex. 3: Find the zeros of the function.

a. $f(x) = x^2 - 4x - 21$

b. $g(x) = 9x^2 - 4$

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AC Math 1
Solving by Factoring WS

Name _____

Solve the equation.

1. $(x+8)(x+6)=0$

2. $x(x-5)=0$

3. $(2x+5)(x-3)=0$

4. $2x(3x-2)=0$

5. $\left(\frac{1}{3}-3x\right)\left(\frac{1}{5}+2x\right)=0$

6. $x^2+7x-18=0$

7. $x^2+11x+18=0$

8. $x^2-49=0$

9. $2x^2-2x-4=0$

10. $x^2+10x+25=0$

11. $x^2 - x = 42$

12. $x^2 - 2x = 63$

13. $x^2 - 48 = -2x$

14. $x^2 = 2x - 1$

15. $2y^2 + 9y = -10$

16. $7m^2 = 8m$

17. $6m^2 - 33m + 15 = 0$

18. $3a^2 + 1 = 4a$

19. $9y^2 = 18y + 16$

20. $m(3m+1) = 2$

21. $y(y-5) = 14$

22. $b(b+9) = 4(5+2b)$

Notes: Solving Quadratic Equations using Square Roots

Ex. 1: Solve using two methods.

$x^2 - 7 = 9$

FACTORING: USING SQUARE ROOTS:

Ex. 2: Solve using square roots.

a. $4r^2 - 7 = 9$ b. $36x^2 = 121$

c. $7x^2 - 8 = 13$ d. $4z^2 + 7 = 12$

Ex. 3: Solve using square roots.

a. $(x + 2)^2 = 10$ b. $2(x - 3)^2 = 18$

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Quadratic Equations w/ Square Roots

Date_____ Period____

Solve each equation by taking square roots.

1) $k^2 + 6 = 6$

2) $25v^2 = 1$

3) $n^2 + 4 = 40$

4) $x^2 - 2 = 17$

5) $9r^2 - 3 = -152$

6) $9r^2 - 5 = 607$

7) $-10 - 5n^2 = -330$

8) $5a^2 + 7 = -60$

9) $4b^2 + 2 = 326$

10) $-8 - 8p^2 = -31$

11) $5x^2 + 9 = 14$

12) $2x^2 - 2 = 6$

13) $8r^2 - 17 = 2471$

14) $13p^2 - 3 = 4209$

15) $7p^2 + 16 = 2151$

16) $13 - 8n^2 = -1139$

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Solving Quadratic Equations
By Factoring & Using Square Roots

Solve each equation or find the zeros of the function by factoring or using square roots.

1. $6x^2 = 14x$

2. $x^2 - 16 = 0$

3. $2(x+4)^2 - 10 = 0$

4. $x^2 + 8x + 15 = 0$

5. $4(x-1)^2 - 100 = 0$

6. $9x(x-7) - 4(x-7) = 0$

7. $2x^2 = 5x + 3$

8. $(x+6)^2 - 40 = 0$

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

10. $f(x) = \frac{2}{3}x^2 - 12$

11. $f(x) = 16x - 24$

12. $f(x) = 10x^2 + 25x - 60$

13. $f(x) = 4x^2 - 1$

14. $f(x) = 16x^2 - 9$

15. $f(x) = 5x(2x-1) + 3(2x-1)$

16. $f(x) = 21x - 3x^2$

17. $f(x) = 4\left(x - \frac{7}{2}\right)^2 - 1$

18. $f(x) = 5x^2 - 14x + 8$

Solving Quadratic Equations by Completing the Square

Example 1:

Which trinomial is a perfect square trinomial? Explain.

$x^2 - 8x + 10$ $x^2 + 8x - 16$ $x^2 + 8x + 16$

Example 2:

Find the value of "c" that makes each trinomial a perfect square trinomial. Then write the expression as the square of a binomial.

a. $x^2 + 12x + c$ b. $x^2 - 24x + c$ c. $x^2 + 5x + c$

Example 3:

Solve each equation by completing the square.

a. $x^2 - 10x + 13 = 0$ b. $x^2 - 8x + 7 = 0$

Example 3:

Solve each equation by completing the square.

c. $3x^2 - 12x + 27 = 0$ d. $2x^2 - 20x + 24 = 0$

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Completing the Square

Date_____ Period____

Find the value of c that completes the square.

1) $x^2 + 6x + c$

2) $z^2 - 10z + c$

3) $x^2 - 34x + c$

4) $r^2 + 32r + c$

5) $r^2 - 6r + c$

6) $r^2 + 20r + c$

7) $x^2 - 38x + c$

8) $a^2 + 12a + c$

9) $x^2 - \frac{25}{13}x + c$

10) $a^2 - 7a + c$

11) $z^2 + \frac{11}{8}z + c$

12) $m^2 + 3m + c$

13) $m^2 + 40m + c$

14) $x^2 + 13x + c$

15) $x^2 - x + c$

16) $n^2 - \frac{1}{2}n + c$

17) $a^2 - 8a + c$

18) $x^2 + \frac{7}{13}x + c$

 Name_____

Solving Equations by Completing the Square

Date_____ Period____

Solve each equation by completing the square.

1) $a^2 + 2a - 3 = 0$

2) $a^2 - 2a - 8 = 0$

3) $p^2 + 16p - 22 = 0$

4) $k^2 + 8k + 12 = 0$

5) $r^2 + 2r - 33 = 0$

6) $a^2 - 2a - 48 = 0$

7) $m^2 - 12m + 26 = 0$

8) $x^2 + 12x + 20 = 0$

9) $k^2 - 8k - 48 = 0$

10) $p^2 + 2p - 63 = 0$

11) $m^2 + 2m - 48 = -6$

12) $p^2 - 8p + 21 = 6$

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13) $m^2 + 10m + 14 = -7$

14) $v^2 - 2v = 3$

15) $5v^2 - 21 = 10v$

16) $4v^2 + 16v = 65$

17) $7b^2 - 14b - 56 = 0$

18) $2n^2 + 12n + 10 = 0$

19) $n^2 + 13n + 22 = 7$

20) $5n^2 + 19n - 68 = -2$

21) $r^2 - 9r - 38 = -9$

22) $3x^2 + 20x + 36 = 4$

23) $x^2 + 7x - 45 = 7$

24) $n^2 + 19n + 66 = 6$

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13) $v^2 - 6v = -91$

14) $n^2 = 18n + 40$

15) $5k^2 = 60 - 20k$

16) $6x^2 - 48 = -12x$

17) $8x^2 + 16x = 42$

18) $9n^2 + 79 = -18n$

19) $2a^2 = -6 + 8a$

20) $2x^2 - 5x + 67 = 0$

21) $4n^2 + 4n + 36 = 0$

22) $7k^2 - 16k + 100 = 0$

23) $10p^2 + 4p + 77 = 9$

24) $3x^2 = -4 + 8x$

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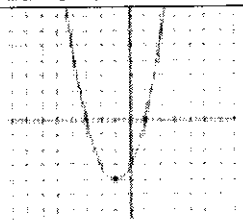
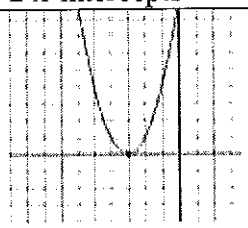
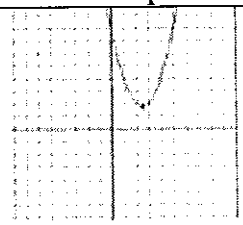
Using the Discriminant

The discriminant of a quadratic equation $ax^2 + bx + c = 0$, is $b^2 - 4ac$. The discriminant is found inside the square root of the quadratic formula. The discriminant tells us the number and nature of the roots of the quadratic.

If the discriminant is:	**Number and Nature**	**number of x-intercepts of the graph of the related function**
Positive	two real roots	 2 x-intercepts
Zero	one real root (a double root)	 1 x-intercept
Negative	two imaginary roots/ no real roots	 0 x-intercepts

In the following examples you will use the discriminant to determine the number and nature of the roots. Find the number of x-intercepts of the parent graph.

Example 1: **Find the discriminant to determine the number and nature of the roots of the equation $3x^2 - 2x + 5 = -12$**

Rewrite the problem. $3x^2 - 2x + 5 = -12$

Write in standard form. $+12 \quad +12$

$3x^2 - 2x + 5 = 0$

Identify *a*, *b*, and *c*. $a = 3, b = -2, c = 5$

Substitute into discriminant. $b^2 - 4ac$

$(3)^2 - 4(-2)(5)$

$9 + 40$

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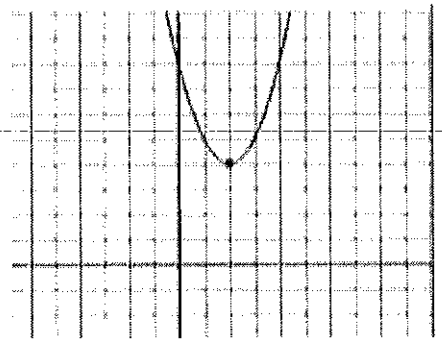
The discriminant is positive therefore the equation has two real solutions. There are 2 x-intercepts.

II. Practice using the discriminant.

Given the graph below determine a) the sign of the discriminant b) the number and nature of the roots.

1.



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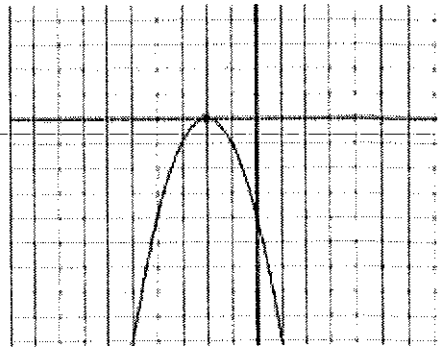

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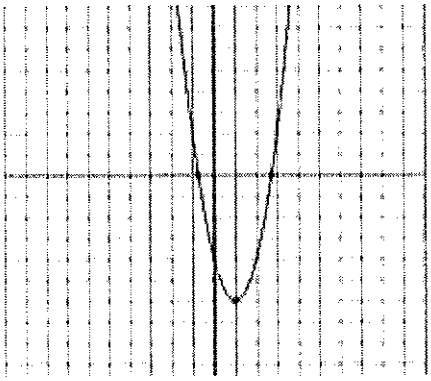

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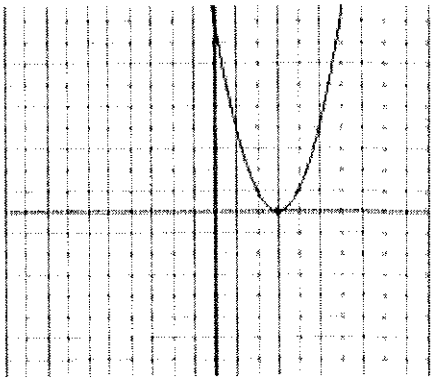

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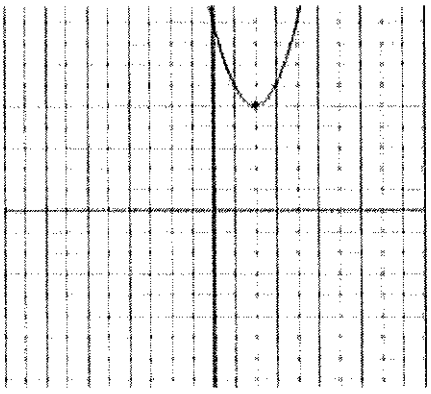

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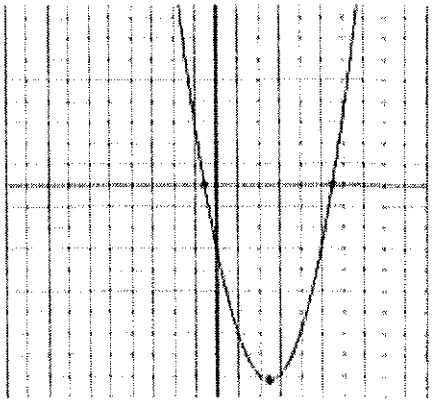

Find the discriminant to determine the number and nature of the roots of the equation.

7. $x^2 + 6x + 4 = 0$
8. $x^2 - 5x - 34 = 0$
9. $2x^2 - 3x + 2 = 0$
10. $3x^2 - 6x + 2 = 0$
11. $3x + 7 = -5x^2 - 4$
12. $-3x^2 + 17x - 2 = 3$
13. $25x^2 - 15x - 64 = 5x - 10$

Find the discriminant to determine the number of x-intercepts of the function.

14. $f(x) = 3x^2 - 4x + 2$
15. $f(x) = -2x^2 + 6x - 8$
16. $f(x) = x^2 - 7x + 6$
17. $f(x) = 9x^2 + 24x + 16$
18. $f(x) = x^2 - 3x + 4$
19. $f(x) = -x^2 - 4$
20. $f(x) = 4x^2 - 28x + 49$

III. Challenge Problems

21. Find all the values of a such that $ax^2 + 3x + 5 = 0$ has two real roots.
22. Find all the values of a such that $ax^2 + 48x + 64 = 0$ has one real root (a double root).
23. Find all the values of a such that $ax^2 + 3x - 6 = 0$ has two imaginary roots.
24. Find all the values of c such that $2x^2 - 6x + c = 0$ has two imaginary roots.
25. Find all the values of c such that $-4x^2 + 8x + c = 0$ has two real roots.
26. Assuming $b \neq 0$, does the sign of b affect the value of the discriminant?

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Using the Quadratic Formula

Date_____ Period____

Solve each equation with the quadratic formula.

1) $m^2 - 5m - 14 = 0$

2) $b^2 - 4b + 4 = 0$

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

4) $2x^2 - 3x - 5 = 0$

5) $x^2 + 4x + 3 = 0$

6) $2x^2 + 3x - 20 = 0$

7) $4b^2 + 8b + 7 = 4$

8) $2m^2 - 7m - 13 = -10$

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9) $2x^2 - 3x - 15 = 5$

10) $x^2 + 2x - 1 = 2$

11) $2k^2 + 9k = -7$

12) $5r^2 = 80$

13) $2x^2 - 36 = x$

14) $5x^2 + 9x = -4$

15) $k^2 - 31 - 2k = -6 - 3k^2 - 2k$

16) $9n^2 = 4 + 7n$

17) $8n^2 + 4n - 16 = -n^2$

18) $8n^2 + 7n - 15 = -7$

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Solving Quadratic Equations
By Factoring & Using Square Roots WS 2

Solve each equation or find the zeros of the function by factoring or using square roots.

1. $10x^2 - 5x = 0$

2. $81x^2 - 16 = 0$

3. $3(x+1)^2 - 9 = 0$

4. $6x^2 = 23x - 7$

5. $2(x-3)^2 - 40 = 0$

6. $9x(x-7) - 4(x-7) = 0$

7. $f(x) = \frac{5}{2}x^2 - 10$

8. $f(x) = 21x - 3x^2$

9. $f(x) = 6x^2 + 15x - 36$

10. $f(x) = 8\left(x - \frac{1}{2}\right)^2 - 2$

11. $f(x) = 16x^2 - 5$

12. $f(x) = 2x^3 - x^2 - 10x + 5$

Accelerated Math I
The Great Quadratic
CFA for Test 5

Name_____

Date ____/____/____ Block ____

Polynomial Operations

Simplify (2 points each)

1. $(2x^2+1)+(x^2-2x+1)-(2x^2+8)$

2. $-3x(5x^2-4x)$

3. $(2x+1)(4x^2-6x+8)$

4. $(4x^2+5x-4)-(x+1)$

Solving Quadratic Equations

Factor each polynomial. (3 points each)

6. $2x^2 + 5x - 12$

7. $18x^3 + 24x^2$

8. $x^2 + x - 42$

9. $x^7 - 9x^5$

Solve each equation by factoring or using square roots. (3 points each)

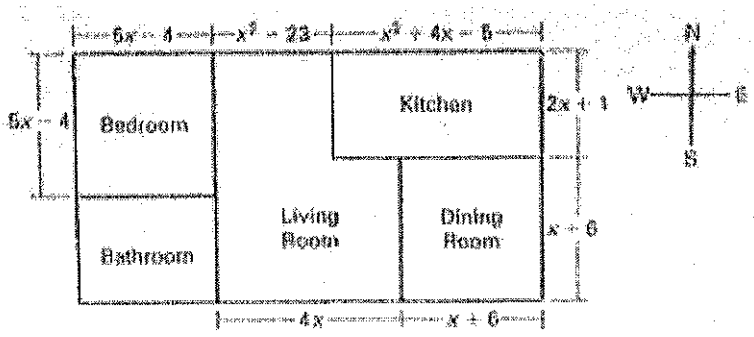
10. $16x^2 - 9 = 0$ **11.** $4(x+5)^2 - 8 = 0$ **12.** $x(x+2) = 3(x+4)$

Find the zeros of each function by factoring or using square roots. (3 points each)

13. $f(x) = x^2 + 8x + 12$ **14.** $f(x) = \frac{2}{3}x^2 - 4$ **15.** $f(x) = x^3 - 5x^2 - 6x + 30$

(3 points each)

16. Your cousin is building a new house. The layout of the first floor is shown in the diagram.



The area of the bathroom is given by the trinomial $5x^2 + 6x - 8$.

a. Factor the trinomial.

b. What do the resulting binomials represent in the floor plan?

c. The area of the bathroom is 24 ft^2. Write an equation using the polynomial above to represent the area of the bathroom. Solve the equation for x.

"bonus" What are the dimensions of the bathroom?