Pre-Calc 11 4.1 Solving Quadratic Equations Graphically

You can solve a ***Quadratic Equation*** of the form $0=ax^{2}+bx+c$ by graphing the corresponding

quadratic function $ f(x)=a\left(x-p\right)^{2}+q$ . The ***solutions*** to a quadratic equation are called the ***roots***

of the equation. You can find the roots of a quadratic equation by determining the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of

the graph, or the ***zeros*** of the corresponding quadratic function.

A quadratic equation can have three outcomes:

* Two roots
* One root
* No roots

Solve graphically and check your roots/solutions.

 $y=\left(x-1\right)^{2}-4 , y=0$

$$f(x)=2\left(x-5\right)^{2} , f(x)=0$$

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

Solve graphically and check your roots/solutions.

$$0=x^{2}-4x+6 $$



$$0=-x^{2}+6x-9$$

$0=-2x^{2}+4x+6 $

Practice on graph paper: p215 #1, 2, 3bef, 4cf

4.2 Part 1 Factoring Polynomial Expressions

The Following are guidelines for factoring polynomials.

1. Look for a \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!!! If there is one take it out and look for further \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. If there is a binomial expression left look for a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. If there is a trinomial of the form $x^{2}+bx+c, $look for two numbers that \_\_\_\_\_\_\_\_\_\_\_\_\_ to "c" but \_\_\_\_\_\_\_\_\_ to "b." Then write your answer with two binomial factors.
4. If there is a trinomial of the form $ax^{2}+bx+c$, look two numbers that multiply to \_\_\_\_\_\_ , but adds to \_\_\_\_\_. Then factor in pairs, and write your answer with two binomial factors.
5. If there is a trinomial which fits the perfect trinomial square pattern, then the answer is two binomial factors which are both the \_\_\_\_\_\_\_\_\_\_\_\_. Square root the \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ terms and the sign matches the middle term sign. Always check the middle term! 2( )( )
6. Lastly, always check to see if there is any further factoring.

Look for a Common Factor (GCF)

 Two Terms Four Terms

If Binomial, look for difference of squares

$a^{2}-b^{2}$

If four terms, try factoring by grouping

 Three Terms

\_\_\_ × \_\_\_ = (a)(c)

\_\_\_ + \_\_\_\_ = b

a ≠ 1

$ax^{2}+bx+c$

\_\_\_ × \_\_\_ = c

\_\_\_ + \_\_\_ = b

a= 1

$$x^{2}+bx+c$$

If Trinomial

$ax^{2}+bx+c$

Perfect Square Trinomial

$\sqrt{a^{2}}+bx+\sqrt{c}$

( \_\_\_\_\_ \_\_\_\_\_ )2

4.2 WS - Summary of Factoring

1. $4x^{2}-12x$ GCF? Type?

1. $x^{2}+7x+12$ GCF? Type?
2. $2x^{2}-8$ GCF? Type?
3. $2x^{2}+3x-2$ GCF? Type?
4. $2x^{2}+12x+16$ GCF? Type?
5. $121x^{2}-1$ GCF? Type?
6. $15x^{2}-65x+20$ GCF? Type?
7. $-x^{2}-11x-24$ GCF? Type?
8. $4x^{2}+20x+25$ GCF? Type?

Pre-Calc 11 4.2 Part 2 Factoring Quadratic Equations

Once a Quadratic Equation is Factored and is equated to zero, we can find the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This is done by equating each bracket to zero and solving for x.

Ex) $\left(x-3\right)\left(x+5\right)=0$ $x-3=0 x+5=0$

For this product to equal zero

Either one or both brackets must equal zero These are the x-intercepts.

|  |
| --- |
| ***GCF*** |
| $$0=6x^{2}+3x$$ | $$ 0=4x^{2}-2x$$ |
| ***Simple Trinomials*** |
| $$x^{2}+8x+12=0$$ | $$x^{2}+3x-10=0$$ |
| $$x^{2}-15x+36=0$$ | $$x^{2}+x-6=0$$ |
| ***Decomposition*** |
| $$3x^{2}+4x-7=0$$ | $$4x^{2}-6x-40=0$$ |
| $$9x^{2}-24x=-16$$ | $$4x^{2}-20x=-25$$ |
| ***Difference of Squares*** |
| $$x^{2}-25=0$$ | $$4x^{2}-9=0$$ |
| $$2x^{2}-8=0$$ | $$x^{2}+4=0$$ |

Practice: p.229 # 1ab,2ab,3abd,4a,7,10

Pre-Calculus 11 4.2 Part 3 Factoring Quadratic Equations

***Solve*** (find the solutions or zeros) the following quadratic equations by ***FACTORING*** (if possible).

|  |  |
| --- | --- |
| $0.2x^{2}-2.2x+5.6=0$ Divide GCF | $0.2x^{2}-2.2x+5.6=0$ Multiply First |
| $$0=\frac{1}{2}x^{2}+\frac{3}{2}x+8$$ |
| $$9x^{2}-0.25=0$$ | $$\frac{9}{16}x^{2}-4=0$$ |

Word Problems

The path of a dog jumping off a dock can be determined by the equation: $h\left(d\right)= -\frac{3}{10}d^{2}+\frac{11}{10}d+2$

Where $h$ is the height above the surface of the water and $d$ is the horizontal distance the dog jumps, both in feet. Determine the horizontal distance of the jump.

 rough graph



The length of an outdoor lacrosse field is 10 m less than twice the width. The area of the field is 6600 m2. Determine the dimensions of an outdoor lacrosse field.

Pre-Calc 11 4.3 Solving by completing the Square / Square Rooting

***Solving by Square Rooting*** – use this process when the initial quadratic equation is in

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form.

1. $x^{2}-64=0$
2. $2x^{2}-18=0$
3. $\left(x+2\right)^{2}-6=0$
4. $2\left(x-3\right)^{2}-14=0$

***Solving by Completing the Square and Square Rooting*** – use when the quadratic equation is initially in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form.

1. $x^{2}+6x-3=0$
2. $-x^{2}+4x+7=0$
3. $2x^{2}+8x-5=0$

Pre-Calc 11 4.3 Part2 Word Problems: Completing the Square/Square Rooting

Ex. A Football is kicked vertically. The approximate height of the ball h in meters after t seconds is given by the Quadratic equation: $h\left(t\right)=1+20t-5t^{2}$. When will the ball hit the ground?

An approx. graph may help, including the starting height (vertical intercept).

Practice:

Projectiles p.241 # 9, 10, 12

Area p.241 # 8, 11

Profit p.233 # 29

Pre-Calc 11 4.3 Solving by Completing the Square WS

Solving by Square Rooting.

1. $3x^{2}-12=0$
2. $\left(x+1\right)^{2}+3=0$
3. $2\left(x-\frac{1}{2}\right)^{2}=4$
4. $2x^{2}-4=0$
5. $\frac{1}{2}\left(x-1\right)^{2}-3=0$

Solving by Completing the Square and Square Rooting.

1. $x^{2}-8x-11=0$
2. $2x^{2}+8x=-4$
3. $-x^{2}+6x-3=0$
4. $-x^{2}+8x-20=0$
5. $-x^{2}+8x+20=0$

Pre-Calc 11 4.4 The Quadratic Formula

The Quadratic Formula is a formula for determining the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a quadratic equation of

the form $ax^{2}+bx+c=0, a\ne 0$. $x=\frac{-b\pm \sqrt{b^{2}-4ac}}{2a}$

The DISCRIMINANT is the expression $b^{2}-4ac$ located under the radical sign in the quadratic formula.

Use the value of the **discriminant** to determine the NATURE of the ROOTS for a quadratic equation:

if the discriminant is POSITIVE, there are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

if the discriminant is ZERO, there is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

if the discriminant is NEGATIVE, there is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Use the discriminant to determine the nature of the roots:

$0=2x^{2}-3x-8$ $0=\frac{1}{4}x^{2}-3x+9$ $3x^{2}-5x=-9$

Use the **quadratic formula** to solve the quadratic equations:

(exact roots and approximate roots rounded to the nearest hundredth)

$9x^{2}+12x=-4$ $5x^{2}-7x-1=0$

You know 4 strategies to solve quadratic equations:

* By
* By
* By
* Using the

Solve using any method:

$6x^{2}-14x+8=0$ $2x^{2}-7x+4=0$ $1.5x^{2}-9x+1.5=0$

 (exact roots)

Leah wants to frame a painting measuring 50 cm by 60cm. Before framing, she places the painting on a rectangular MAT so that a uniform strip of the MAT is shown on all sides of the painting. The area of the MAT is twice the area of the painting. How wide is the strip of exposed MAT showing on all sides of the painting, to the nearest tenth?

Practice: p242 #13ab & p254 # 1abc, 2abc, 3ace, 5ab

Pre-Calculus 11 4.4 Part2 Quadratic Equation – Word Problem

Ex: Leah wants to frame a picture measuring 50cm by 60 cm. Before framing, she places the painting on the rectangular MAT so that a uniform strip of the mat is showing on all of the sides of the painting. The area of the mat is twice the area of the painting. How wide is the strip of exposed MAT, to the nearest tenth?

Practice:

p.215 # 6,7

p.255 # 12,18

p.230 # 12,21,22,29