Unit 2 Exam Review

Chapter 4: Quadratic Relations

Chapter 5: Quadratic Expressions

Chapter 6: Quadratic Equations

CHAPTER 4

FACTORED FORM: $y = a(x-r)(x-s)$

VERTEX FORM: $y = a(x-h)^2+k$

VERTEX FORM

$$y = a(x-h)^2 + k$$

The vertex of of the parabola is: (h , k)

The axis of symmetry is: $x=h$

a: up/down opening
vert. stretch/compress

h: horizontal translation.

k: vertical

What is the vertex? What is the axis of symmetry? and Describe the transformation compared to $y=x^2$?

$y = 3(x+20)^2-15$

a=3
h=-20
k=-15

vert: (-20,-15)
aos: x=-20
-vert. stretch by 3
-left 20
-down 15

Write the equation of the graph based on the description of the transformation:

Vertical compression by a factor of 1/5. Shift 3 right and 1 down:

$a=\frac{1}{5}$
h=3
k=-1

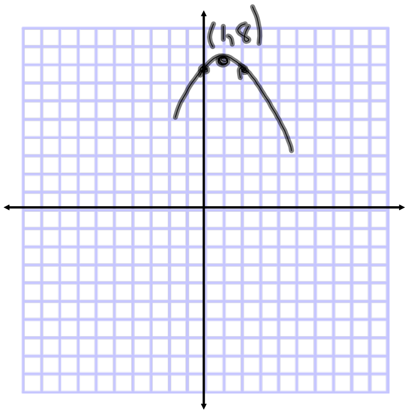
$y=\frac{1}{5}(x-3)^2-1$

Fill in the following table for the quadratic function shown and then graph it.

Property	$y = -1/2(x - 1)^2 + 8$
Vertex	(1,8)
Axis of Symmetry	x=1
Stretch or compression factor ("a" value)	comp. by 1/2
Direction of Opening	down
Values *x* may take	any real #
Values that *y* may take	$y \leq 8$

$y = -1/2(x - 1)^2 + 8$

x	y
0	7.5
1	8
2	7.5



FACTORED FORM

$y = a (x - r)(x - s)$

State the x-intercepts of:

a) $y = 5(2x-3)(x-2)$

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

$2x-3=0$ $\quad$ $x-2=0$

$2x=3$ $\quad$ $\boxed{x=2}$

$\boxed{x=3/2}$

Sketch the graph of y = 2(x+1)(x-7) , <u>label the x-intercepts, vertex, and axis of symmetry</u>

Before sketching you must:
a) Find the x-intercepts?
b) Find the axis of symmetry?
c) Find the vertex?

a) $y=2(x+1)(x-7)$

$x+1=0$ r $\quad$ $x-7=0$ s

$\boxed{x=-1}$ $\quad$ $\boxed{x=7}$

b) $x=\frac{r+s}{2}$

$x=\frac{-1+7}{2}$

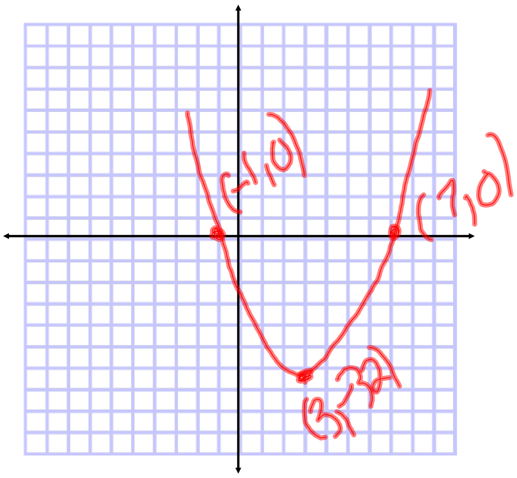
$\boxed{x=3}$ ← x-coord of vertex

c) $y = 2(3+1)(3-7)$

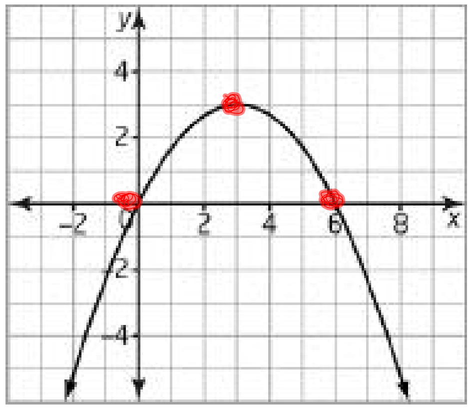
$y = 2(4)(-4)$

$= -32$

vert: $(3, -32)$



Determine an equation in the form $y = a(x-r)(x-s)$ to represent the parabola. Consider the vertex and the x-intercepts



How to write the equation of a parabola in factored form:

1) Find the x-intercepts: *r* and *s*
2) Find another point on the graph *(x,y)*
3) Plug values for *r,s,x, and y* into y=a(x-r)(x-s)
4) Solve for *a*
5) Write the final equation by plugging in values for *a,r, and s*. Not *x* and *y*.

x-int: 0 r and 6 s

point: (3, 3) x y

$y = a(x-r)(x-s)$

$3 = a(3-0)(3-6)$

$3 = a(3)(-3)$

$3 = a(-9)$

$\frac{3}{-9} = a$

$a = -\frac{1}{3}$

$y = -\frac{1}{3}(x)(x-6)$

CHAPTER 5/6

- **Multiply Polynomials:** FOIL method

- Common Factoring

- Factoring ax^2+bx+c where 'a' is 1 or can be factored out and when 'a' is not 1 and can't be factored out.

- Solve by Factoring or Quadratic Formula

- Graph quadratics in standard form

- Completing the Square

- Applications

HOW TO USE FOIL

FIRST
OUTSIDE
INSIDE
LAST

(3x + 7) (x - 5)

Note: You can find the product of two binomials by multiplying each term in the first binomial by each term in the second binomial. Then simplify by collecting like terms.

Simplify 4(x-2)(x+4) by using FOIL

$4(x-2)(x+4)$

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

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

$= 4x^2 + 8x - 32$

Greatest Common Factor: The greatest number and/or variable that is a factor of two or more terms.

Method:

To factor a polynomial:

1) remove the GCF as the first factor
2) and then divide each term by the GCF to obtain the second factor.

Factor: $25x^6 + 15x^4$

$= 5x^4\left(\frac{25x^6}{5x^4} + \frac{15x^4}{5x^4}\right)$

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

HOW TO SOLVE QUADRATICS

Solving a quadratic means to find the x-intercepts or roots.

To solve a quadratic equation:

1) It must be set to equal 0. Before factoring, it must be in the form $ax^2+bx+c=0$
2) Factor the left side of the equation
3) Set each factor to equal zero and solve for 'x'.

zero product rule: if two factors have a product of zero; one or both of the factors must equal zero.

Solve $x^2 + 9x = -14$

$x^2+9x+14=0$

P: 14
S: 9

$\boxed{7 \text{ and } 2}$

$(x+7)(x+2)$

Solve $2x^2 - 11x = -15$

$2x^2-11x+15=0$

P: 30
S: -11

$\boxed{-6 \text{ and } -5}$

$2x^2-11x+15=0$

$2x^2-6x-5x+15=0$

$(2x^2-6x)+(-5x+15)=0$

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

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

$\boxed{x=3 \quad x=\frac{5}{2}}$

Use the Quadratic Formula to solve: $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$0 = 2x^2 + 9x + 6$

a = 2
b = 9
c = 6

$x=\frac{-9\pm\sqrt{9^2-4(2)(6)}}{2(2)}$

$x=\frac{-9\pm\sqrt{81-48}}{4}$

$x=\frac{-9\pm\sqrt{33}}{4}$

$x=\frac{-9+\sqrt{33}}{4}$ $\quad x=\frac{-9-\sqrt{33}}{4}$

$x=-0.8$ $\quad x=-3.7$

Rule: $(a+b)^2 = a^2 + 2ab + b^2$
Rule: $(a-b)^2 = a^2 - 2ab + b^2$

To go from standard form to vertex form, you must go through the process of completing the square

Steps to Competing the Square:

1) Put brackets around the first two terms
2) Factor out the common number (not the letter)
3) Look at the last term in the brackets, divide it by 2 and then square it.
4) Add and subtract that term behind the last term in the brackets.
5) Move the negative term outside of the brackets by first multiplying it by the 'a' value.
6) Simplify the terms outside of the brackets.
7) Factor the perfect square trinomial

Convert the following equation into the vertex form (completing the square)

~~$y = -3x^2 + 9x - 13$~~

$y=2x^2+12x-13$

$y=(2x^2+12x)-13$

$y=2(x^2+6x)-13$

$y=2(x^2+6x+\underline{?})-13$

$y=2(x^2+6x+9-9)-13$

$y=2(x^2+6x+9)-18-13$

$y=2(x^2+6x+9)-31$

$y=2(x+3)^2-31$