Warm Up

6/2

Factor the following:

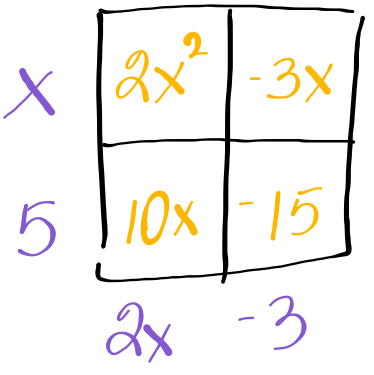
$$5x^2 - 40x$$

$5x(x-8) = 5x^2 - 40x$

$$2x^2 + 7x - 15$$

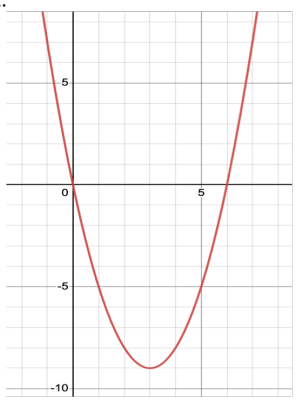
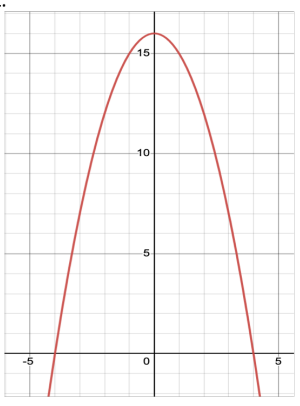
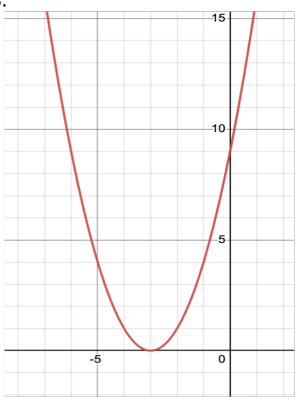
$2x^2 + 10x - 3x - 15$

$(2x-3)(x+5)$



Homework Questions?

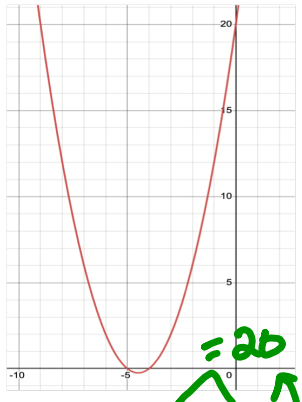
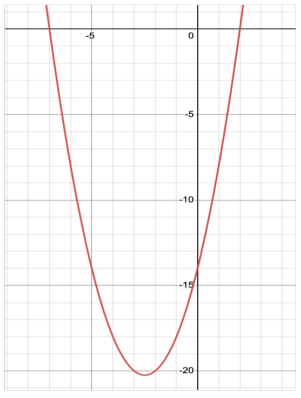
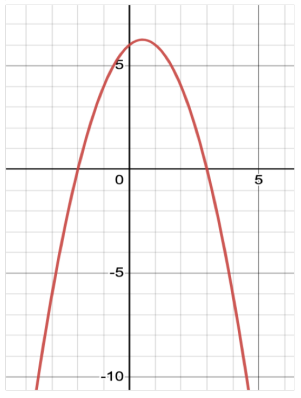
Problem 2.4 A

	1. 	2. 	3. 
Factored Form	$y = x(x-6)$	$y=(4-x)(4+x)$	$y=(x+3)^2$
Expanded Form	$y=x^2-6x+0$	$y = 16 - x^2$ $y=-x^2+16$	$y = x^2 + 6x + 9$
y-intercept	(0,0)	(0,16)	(0,9)
x-intercept(s)	(0,0) (6,0)	(-4,0) (4,0)	(-3,0)
Min/Max	Min: (3,-9)	Max: (0,16)	Min: (-3,0)
Line of Symmetry	x = 3	x = 0	x = -3
Opens Up/Down	Up	Down	Up

What do we notice?

y-int is "c" ax^2+bx+c

Open down - a is a negative value

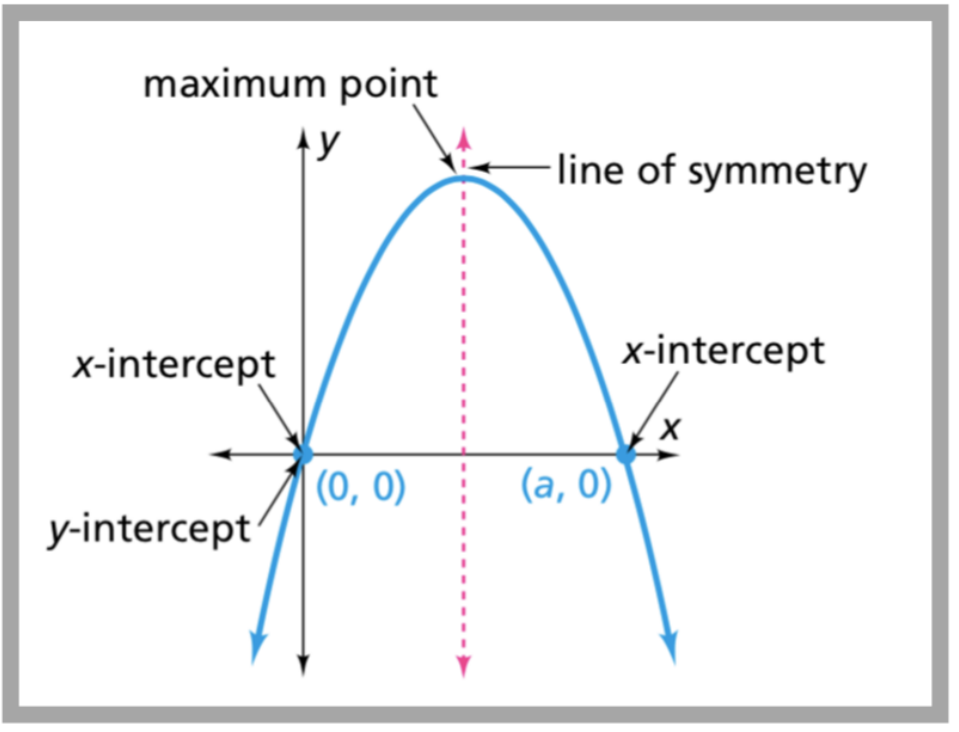
	4. 	5. 	6. 
Factored Form	$y=(x+4)(x+5)$	$y=(x+7)(x-2)$	$y=(3-x)(2+x)$
Expanded Form	$y=x^2+9x+20$	$y=x^2+5x-14$	$y=-x^2+x+6$
y-intercept	$(0,20)$	$(0,-14)$	$(0,6)$
x-intercept(s)	$(-5,0)$ $(-4,0)$	$(-7,0)$ $(2,0)$	$(-2,0)$ $(3,0)$
Min/Max	Min: $(-4.5,-0.25)$	Min: $(-2.5,-20.25)$	Max: $(0.5,6.25)$
Line of Symmetry	$x=-4.5$	$x=-2.5$	$x=0.5$
Opens Up/Down	Up	Up	Down

=20

What do we notice?

LOS is the same as x-coordinate of the vertex (min or max)

Graphing Parabolas



We can easily graph a parabola if we can find 4 key features.

- y-intercept
- x-intercept(s)
- Line of Symmetry (LOS)
- Vertex

All of these features can be found from the equation!

Let's find the key features for

$$y = x^2 + 2x - 8$$

Let's find the key features for

$$y = x^2 + 2x - 8$$

It helps to have both the expanded and factored forms of the equation.

$$x^2 + 2x - 8$$

a: 1

b: 2

c: -8

ac: -8

Factors of -8	Sums = 2
-1, 8	7
-2, 4	2
1, -8	-7
2, -4	-2

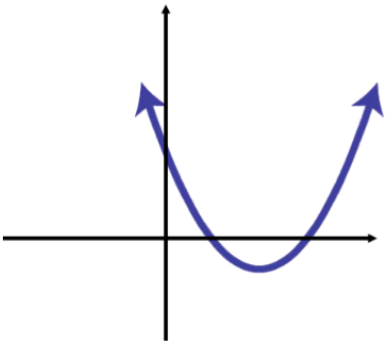
$$x^2 + 2x - 8$$

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

	x	4
x	x^2	$-2x$
-2	$4x$	-8

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

How do we find the y-intercept?



The y-intercept is the value of y when ...

$x = 0$

Using expanded form:

$y = x^2 + 2x - 8$

$y = (0)^2 + 2(0) - 8$

$= 0 - 8 = -8$

$(0, -8)$

Using factored form:

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

$= (0 - 2)(0 + 4)$

$= (-2)(4) = -8$

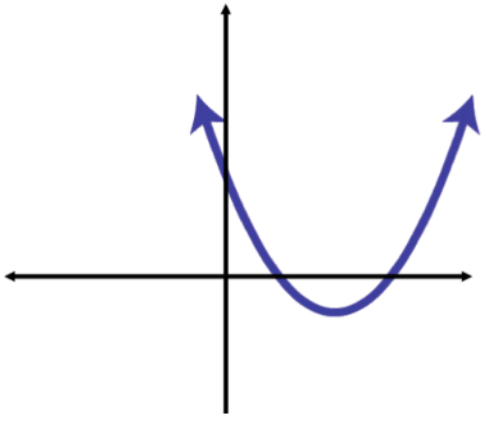
$(0, -8)$

y-intercept: $(0, -8)$

Expanded Form: $y = ax^2 + bx + c$ — c: y-int

Factored Form: $y = (x+m)(x+n)$ — multiply to find y-int

How do we find the x-intercept(s)?



The x-intercept is the value of x when ...

$y = 0$

Using factored form:

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

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

Using expanded form:

$y = x^2 + 2x - 8$

$0 = x^2 + 2x - 8$

???

No idea how to solve!

How do we do this?

Zero Product Property

If (a)(b) = 0, either a=0, b=0, or both a and b are equal to zero.

We can use this on the factored form!

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

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

$x - 2 = 0$

$+2 \quad +2$

$x = 2$

$x + 4 = 0$

$-4 \quad -4$

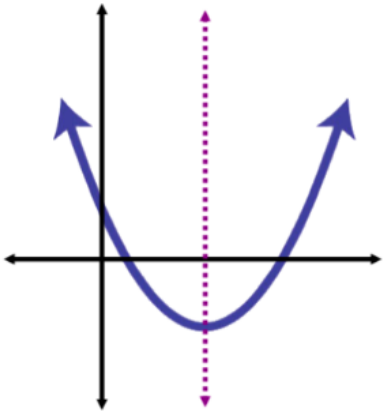
$x = -4$

x-intercepts: $(2,0)$ and $(-4,0)$

Best form of the equation for finding x-intercepts?

FACTORED FORM

How do we find the Line of Symmetry?



The line of symmetry (LOS) is exactly halfway between our x-intercepts

We need to find the x-value halfway

in between the x-ints.

x-ints

(2,0)

(-4,0)

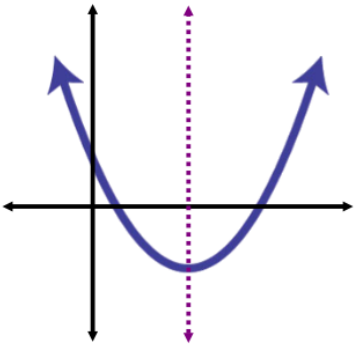
We need to find the number halfway between 2 and -4

find the average of the x-ints.

$$\frac{2+-4}{2} = -\frac{2}{2} = -1$$

Line of Symmetry: $x = -1$

How do we find the vertex?



We know the vertex is a point on the

Line of Symmetry

$x = -1$

To find the coordinates of the vertex we can use our equation and substitute in the LOS for the value of x and solve for y.

Using factored form:

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

$y = (-1 - 2)(-1 + 4)$

$= (-3)(3)$

$= -9$ — y-value of the vertex

$(-1, -9)$

Using expanded form:

$y = x^2 + 2x - 8$

$= (-1)^2 + 2(-1) - 8$

$= 1 - 2 - 8 = -9$

Vertex:

$(-1, -9)$

How does the value of 'a' affect the parabola?

Use Desmos to graph the following:

$y = x^2$ $\quad\quad$ $y = -x^2$

$y = 3x^2$ $\quad\quad$ $y = -3x^2$

$y = 0.5x^2$ $\quad\quad$ $y = -0.5x^2$

What aspects of the parabola does 'a' control?

Opens up or down – positive → opens up
negative → opens down

Thin or wide – larger # → thinner parabola
smaller # → wider
(fraction)

ax^2+bx+c

up/down
thin or wide

y-int

$(x+m)(x+n)$

$m \cdot n$ = y-int

For Homework:

Find the key features for the following equations of parabolas and fill in the table below. Do all your work in your notebook.

1. $y = x^2 + 8x + 15$

2. $y = 2x^2 + 5x - 3$

Expanded Form	$y = x^2 + 8x + 15$	$y = 2x^2 + 5x - 3$
Factored Form		
Key Features		
Opens Up/Down		
y-intercept		
x-intercepts		
Line of Symmetry		
Vertex		

Homework

Finish classwork