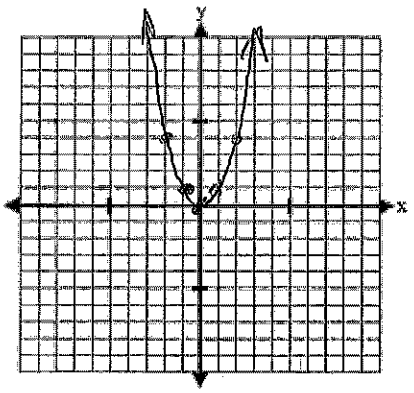
Day #28: Graphing in Standard Form and Factored Form

Factored Form	$y = a(x-p)(x-q)$
Standard Form	$y = ax^2+bx+c$

Graph the quadratic function and identify the characteristics.

1. $y = x^2$

x	$y = x^2$
-2	4
-1	1
0	0
1	1
2	4



Vertex: (0,0)

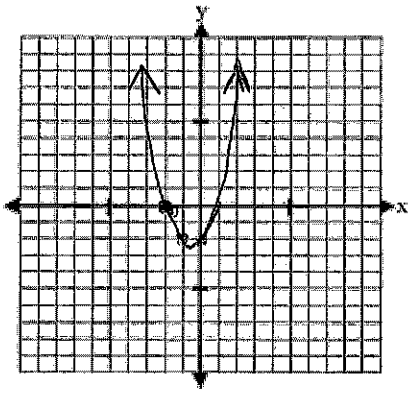
A.O.S. $x=0$

x-intercept(s): $x=0$

y-intercept: $y=0$

2. $y = (x + 2)(x - 1)$

x	$y = (x + 2)(x - 1)$
-2	0
-1	-2
-0.5	-2.25
0	-2
1	0



Vertex: (-.5, -2.25)

A.O.S. $x=-.5$

x-intercepts: $x=-2, x=1$

y-intercept: $y=-2$

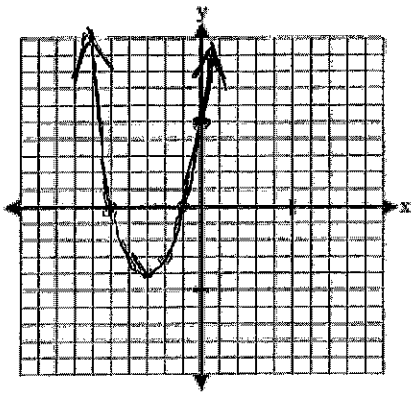
a. **Multiply** out $y = (x + 2)(x - 1)$ and simplify to **standard form** using the area model or EWE (each with each). What information does **standard form** tell us?

	x	$+2$
x	x^2	$2x$
-1	$-1x$	-2

$= x^2 + x - 2$

3. $y = (x + 1)(x + 5)$

x	y = (x + 1)(x + 5)
-5	0
-4	-3
-3	-4
-2	-3
-1	0
0	5



Vertex: (-3, -4)

A.O.S. $x = -3$

x-intercepts: $x = -5, x = -1$

y-intercept: $y = 5$

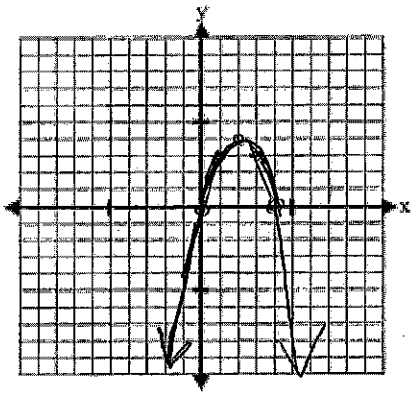
b. **Multiply** out $y = (x + 1)(x + 5)$ and simplify to **standard form** using the area model or EWE (each with each). Does the "c" value in **standard form** match the y-intercept on the graph?

	x	$+1$
x	x^2	$1x$
$+5$	$5x$	5

$= x^2 + 6x + 5$

4. $y = -x(x - 4)$

x	y = -x(x - 4)
0	0
1	3
2	4
3	3
4	0



Vertex: (2, 4)

A.O.S. $x = 2$

x-intercepts: $x = 0, x = 4$

y-intercept: $y = 0$

c. **Multiply** out $y = -x(x - 4)$ and simplify to **standard form** using the area model or EWE (each with each). Does the "c" value in **standard form** match the y-intercept on the graph?

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

$= -x^2 + 4x + 0$

Summarize:

1. What information can you get about a graph by just looking at the FACTORED form of an equation? (for example y = (x - 4)(x + 7))

x-intercepts $(x=4 \text{ \& } x=-7)$

2. What information can you get about a graph by just looking at the STANDARD form of an equation? (for example $y = x^2 + 3x - 18$)

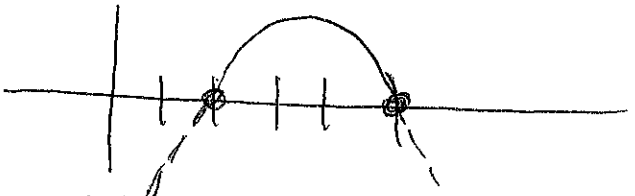
y-intercept $(y=-18)$

Application Problems

1. a. Let's say you kicked a soccer ball 2 seconds after the clock started, and it landed 5 seconds after the clock started. Write an equation in factored form to represent this, if **x** represents time and **y** represents the height of the ball in the air.

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

b. Draw a quick sketch using some numbers of what the path of the soccer ball might look like on a graph.



c. Your friend is recording you, and when played back you notice that at 3 seconds, the ball is at a height of 12 feet in the air. Let's use this information to write an EXACT equation.

$12 = a(3-2)(3-5)$

$\frac{12}{-2} = \frac{a(1)(-2)}{-2}$

$-6 = a$

Equation: $y = -6(x-2)(x-5)$

d. Multiply out your equation from **part c** to change it to standard form.

$6(x-2)(x-5) = -6(x^2-7x+10) = -6x^2+42x-60$

	x	-2
x	x^2	$-2x$
-5	$-5x$	10

e. What is the y-intercept? Does this make sense? Why or why not?

-60, doesn't make sense b/c it's below the ground

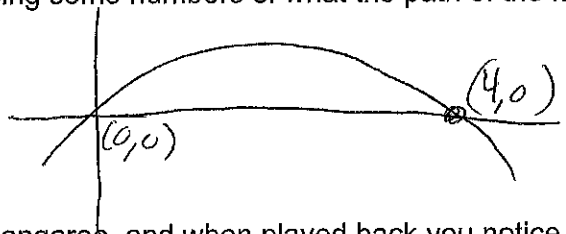
You try:

2.

a. A large kangaroo jumps when the clock starts (at zero seconds). The kangaroo lands on the ground after 4 seconds. Write an equation in factored form to represent this, if **x** represents time and **y** represents the height of the kangaroo in the air.

$y = a(x-0)(x-4)$

b. Draw a quick sketch using some numbers of what the path of the kangaroo might look like on a graph.



c. You are recording the kangaroo, and when played back you notice that at 2 seconds, the kangaroo is at a height of 8 feet in the air. Let's use this information to write an EXACT equation.

$8 = a(2-0)(2-4)$

$8 = a(2)(-2)$

$8 = a(-4)$

$\frac{8}{-4} = \frac{a(-4)}{-4}$

$-2 = a$

Equation: $y = -2(x-0)(x-4)$

d. Multiply out your equation from **part c** to change it to standard form. What is the y-intercept? Does this make sense? Why or why not?

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

	x	0
-4	$-4x$	0

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

0 makes sense. It started on the ground