

Chapter 5 Notes:

Day _____

5-1 Modeling Data with Quadratic Functions

A quadratic function's standard form is

$$\boxed{} \quad a \neq 0$$

The domain is always _____ or _____

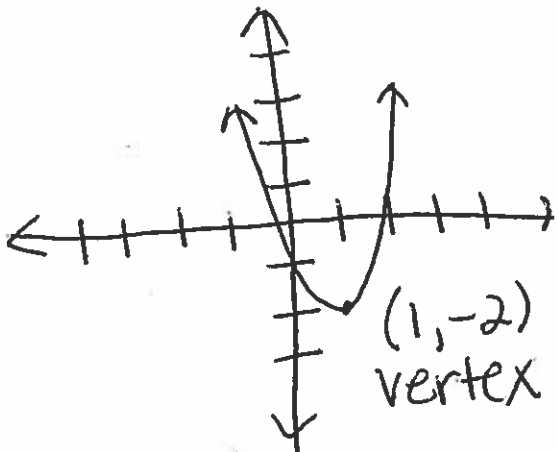
$$f(x) =$$

The graph of a linear function is a _____.

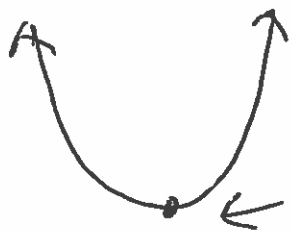
The graph of a _____ function is a _____.

The axis of symmetry _____

The y-value of the _____



D:
R:
max/min
A.O.S.
vertex



opens up, "a" value is _____

← vertex is a _____



opens down, "a" value is _____

vertex is a _____

Practice 5-1

Modeling Data with Quadratic Functions

Find a quadratic model for each set of values. **Graphing Calculator**

1. $(-1, 1), (1, 1), (3, 9)$ 2. $(-4, 8), (-1, 5), (1, 13)$ 3. $(-1, 10), (2, 4), (3, -6)$

4.

x	-1	0	2
$f(x)$	1	-1	7

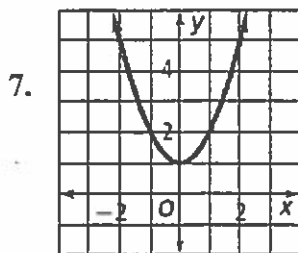
5.

x	-4	0	1
$f(x)$	1	9	16

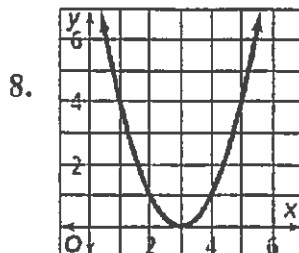
6.

x	-1	2	3
$f(x)$	12	3	4

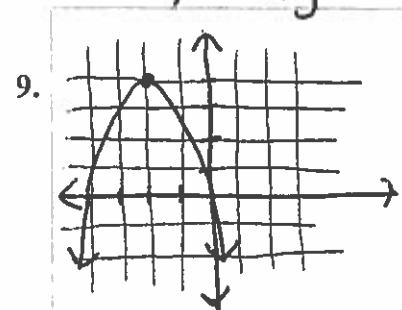
Identify the vertex and the axis of symmetry of each parabola. **Domain/Range**



V:
A.O.S.:
D:
R:



V:
A.O.S.:
D:
R:



V:
A.O.S.:
D:
R:

For 10-18, simplify 1st if possible.

Determine whether each function is linear or quadratic. Identify the quadratic, linear, and constant terms.

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

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

12. $y = 5x(x-5) - 5x^2$

13. $f(x) = 7(x-2) + 5(3x)$

14. $f(x) = 3x^2 - (4x-8)$

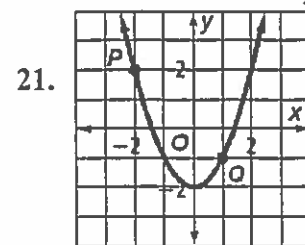
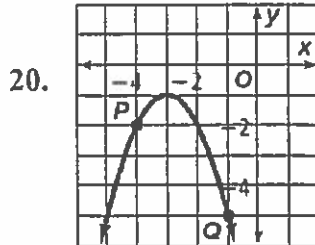
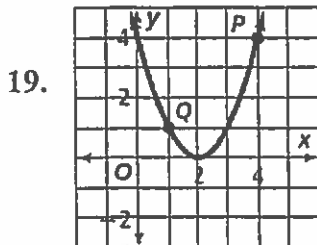
15. $y = 3x(x-1) - (3x+7)$

16. $y = 3x^2 - 12$

17. $f(x) = (2x-3)(x+2)$

18. $y = 3x - 5$

For each parabola, identify points corresponding to P and Q . Vertex, A.O.S., Range



D:
R:

$P'(\quad , \quad)$
 $Q'(\quad , \quad)$
 V:
 A.O.S.

22. A toy rocket is shot upward from ground level. The table shows the height of the rocket at different times.

Time (seconds)	0	1	2	3	4
Height (feet)	0	256	480	672	832

calculator

a. Find a quadratic model for this data.

b. Use the model to estimate the height of the rocket after 1.5 seconds.

ch. 5 p. 4

5.2 Properties of Parabolas

Day _____

3 CASES

① $y = ax^2$ vertex is always
A.O.S. :

The "a" value tells you 2 things

1.)

2.)

② $y = ax^2 + c$ vertex is always
A.O.S. :

$y = x^2 + 2$ vertex: A.O.S.

$y = -3x^2 + 4$

$y = 2x^2 - 1$

The "c" value is always the _____
For any parabola.

Examples:

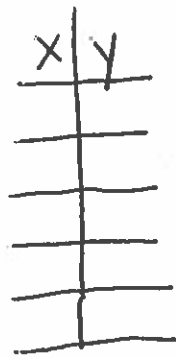
① $y = \frac{1}{2}x^2$

vertex:

A.O.S.:

D:

R:



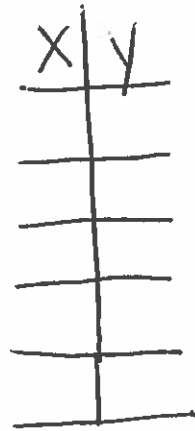
② $y = -5 + 3x^2$

V:

A.O.S.:

D:

R:



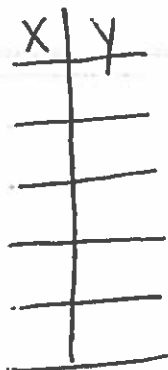
③ $y = -x^2 + 4$

V:

A.O.S.:

D:

R:



③ $y = ax^2 + bx + c$ OR $y =$

The formula to find the x-value of the vertex and the axis of symmetry is...



Examples continued...

$$\textcircled{4} \quad y = x^2 + 5x + 2$$

$$\textcircled{5} \quad y = 3x^2 - 12x$$

5.2

$$\textcircled{6} \quad y = -\frac{1}{3}x^2 - 2x - 3$$

Use the formula $X = -\frac{b}{2a}$ in word problems
to help find the maximum and minimum.

⑦ T.B. p. 248 (#29)

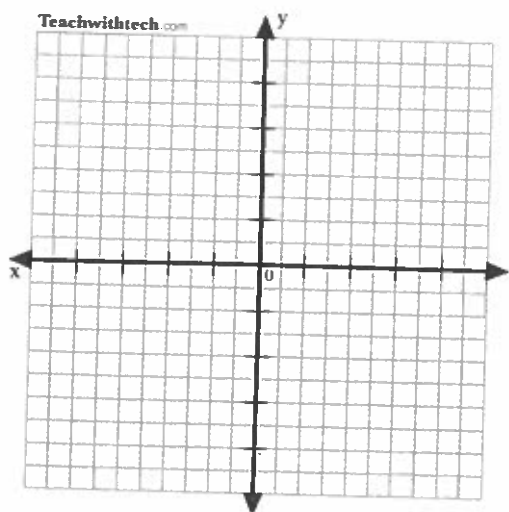
⑧ p. 248 (#30)

ch. 5 p. 8

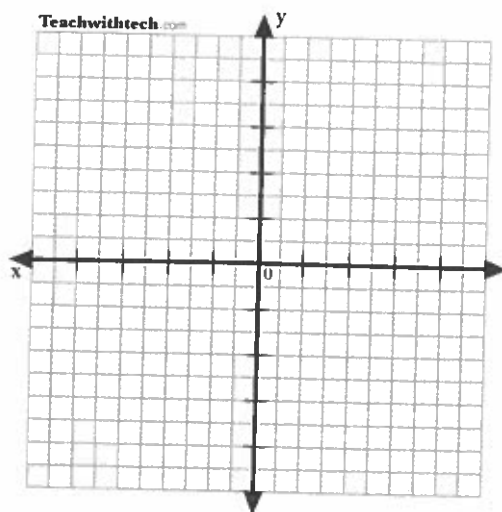
9 $y = -\frac{1}{4}x^2 + 2x - 3$

5.2

10 T.B. p. 248 (#32)
Sketch the parabola
with a vertex $(-1, -4)$
and a y -intercept of 3.



11 T.B. p. 248 (#34)
vertex $(2, 3)$ point $(6, 9)$



(Ch. 5 p. 9)

p. 249

12

#45

13

#47

(ch. 5 p. 10)

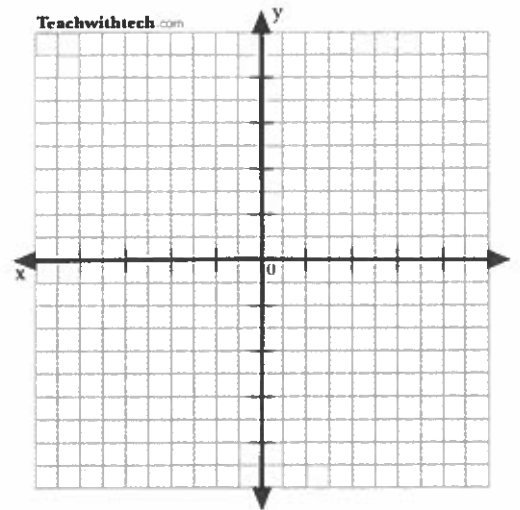
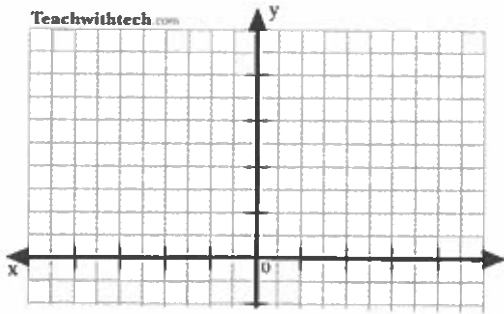
5.3 Transforming Parabolas

Standard Form

vertex form

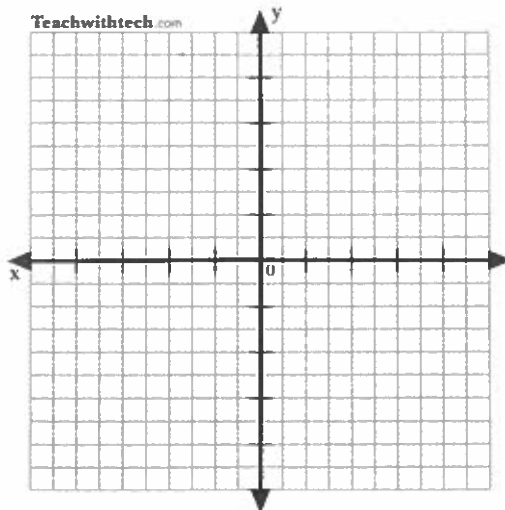
① GRAPH THE FOLLOWING (like 2-6 on the HW)

EX.1 $y = (x-2)^2$ EX.2 $y = -3(x+4)^2 - 2$



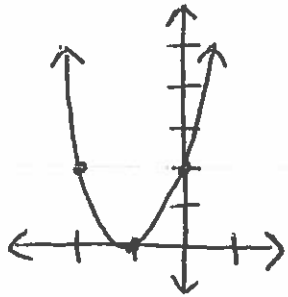
EX.3

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



② Use vertex form to write the equation of the parabola. (like 13-16, 19, 20, 43, 44 on ttw) (5.3)

ex. 4 vertex: (,) Any point on the parabola (,)



Plug h, k, x and y into vertex form:

$$=$$

and solve for the "a" value. Then only plug in h, k and the a value into the vertex form for the final answer.

ex. 5 vertex $(-2, 6)$

y -intercept: 12

ex. 6

3 Write the equation in vertex form when it is in standard form. (like # 27, 30, 33, 35) on the hw

5.3

ex. 7 $y = 2x^2 + 10x + 7$

Identify the " " value and the vertex.

ex. 8 $y = -3x^2 + 12x + 5$

4 Identify the vertex and y-intercept. (like # 23+25) on the hw

ex. 9 $y = -1.5(x+20)^2$

Let $x=0$, and solve for y .

ex. 10 $y = .0035(x+1)^2 - 2$

ch. 5 p. 13

5.4 Factoring Quadratic Expressions

Day _____

① When Factoring, Always look for a _____
First !!

Examples

1.) $7p^2 + 21p$

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

3.) $9x^2 + 3x - 18$

4.) $4w^3 + 8w^2 + 2w$

5.) $9n^2 + 24n - 3$

② Factoring Trinomials when _____
 $ax^2 + bx + c$

$$\begin{cases} x^2 + bx + c = (\quad)(\quad) \\ x^2 - bx + c = (\quad)(\quad) \end{cases}$$

* need to see what multiplies to get " "

$$\begin{cases} x^2 - bx - c = (\quad)(\quad) \\ x^2 + bx - c = (\quad)(\quad) \end{cases}$$

and adds to get " "

* IF there is nothing, it is _____ which means
it is _____ ch. 5 p. 14

Examples:

1) $x^2 + 12x + 32$

2) $m^2 + 14m + 40$

3) $m^4 + 14m^2 + 40$

4.) $x^2 - 6x + 8$

5.) $x^2 - 7x + 12$

6.) $x^2 + 7x + 12$

7.) $x^2 + 4x - 5$

8.) $x^2 + 6x - 5$

9.) $x^2 - 14x - 32$

10.) $x^2 + 10x - 75$

11.) $x^2 + 3x - 10$

12.) $x^2 + 10x + 24$

13.) $x^2 - 14x + 33$

14.) $x^2 - 14x + 49$

5.4 Notes... Factoring Trinomials Day _____
When $a \neq 1$ & Difference of 2 Squares

③ Difference of 2 Squares:
★

Perfect Square Numbers:

Examples:

1.) $x^2 - 64$

2.) $x^2 + 64$

3.) $4a^2 - 49$

4.) $3x^2 - 12$

5.) $18y^3 - 98y$

6.) $25x^2 - 121$

7.) $\frac{1}{4}x^2 - \frac{25}{36}y^2$

④ Factoring Trinomials when $a \neq 1$

Examples:

1.) $2x^2 - 16x + 32$

2.) $2x^2 + 11x + 12$

3.) $3x^2 - 16x - 12$

$$4.) 2x^2 - 7x + 6$$

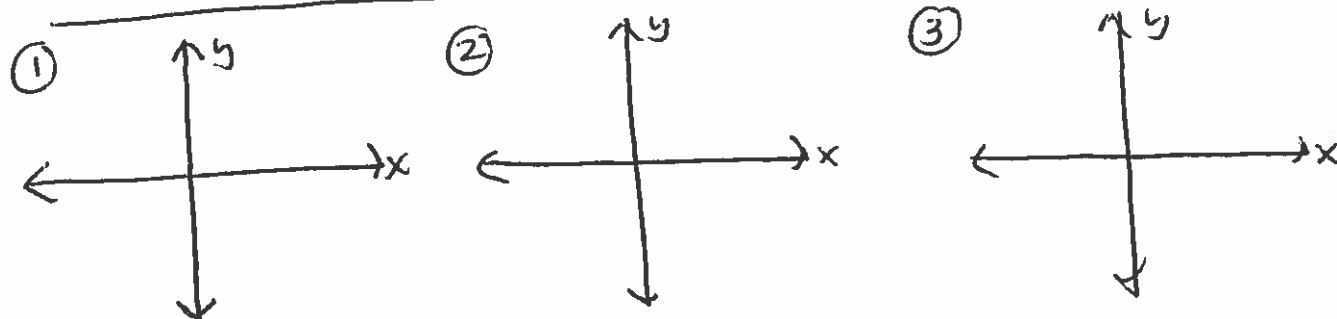
Perfect Square Trinomials

$$5.) 9x^2 - 30x + 25$$

$$6.) 16x^2 + 48x + 36$$

5.5 Solving Quadratic Equations Day _____

The goal is to find the _____



There are 5 Methods to Solve a Quadratic Equation

- ①
- ②
- ③
- ④
- ⑤

① Solve by Graphing.

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

1st:

2nd:

3rd:

Ch. 5 p. 19

Solve by Graphing

(5.5)

$$x^2 + \frac{1}{2}x - \frac{1}{4} = 0$$

(2) Factoring:

1st:

2nd:

3rd:

(ex1) $x^2 + 7x = 18$

(ex2) $16x^2 = 8x$

(ex3) $x^2 + 6x + 5 = 45$

(ex4) $4x^2 + 4x = 3$

③ Finding Square Roots

5.5

o

o

o

you can solve 2 different ways sometimes...

Factoring (Difference)
of 2 squares

$$4x^2 - 25 = 0$$

Finding Square Roots

$$4x^2 - 25 = 0$$

ex) $3x^2 - 24 = 0$

ex) $3(x+3)^2 = 27$

ch. 5 p. 21

(5.5)

(ex) $7x^2 - 243 = 0$

(ex) p. 270 #19 $y = -16t^2 + 1700$

ch. 5 p. 22

5.6 Complex Numbers

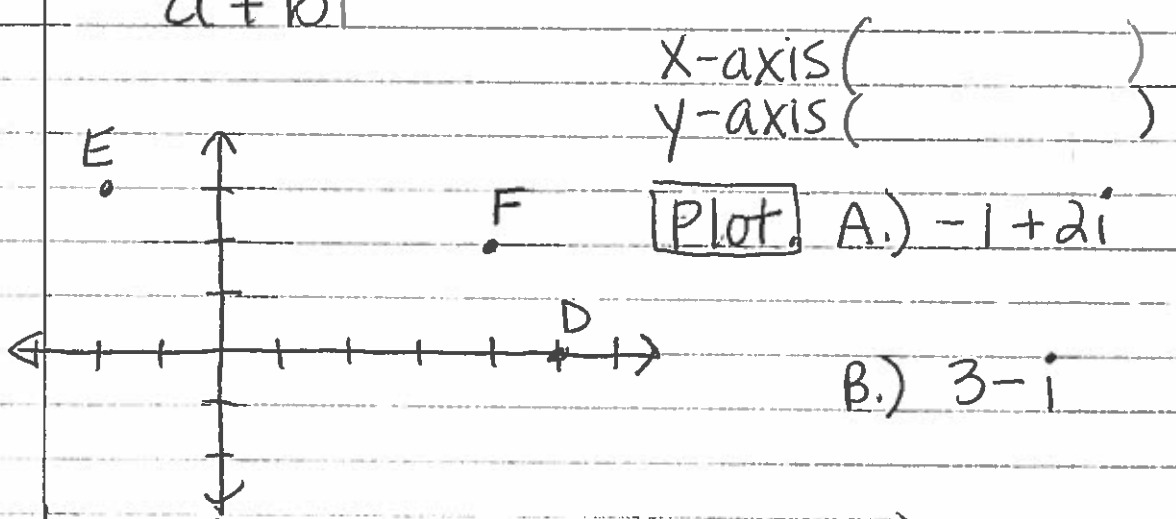
$i = \sqrt{-1}$ $i^2 =$
 $i^3 =$
 $i^4 =$

① Simplifying Radicals.

- (a) $\sqrt{-2} =$ (b) $\sqrt{-81} =$
 (c) $\sqrt{-12} =$ (d) $\sqrt{-72} =$

② Complex Numbers ()

$a + bi$



Identify the pt. & Additive Inverse.

- D.)
- E.)
- F.)

③ Write in the form, $a+bi$.

5.6

a.) $\sqrt{-18} + 7$

b.) $\sqrt{-21} - 6$

④ Additive Inverse ()

$$\begin{array}{l} 5i \rightarrow \\ 4-3i \rightarrow \\ -7+2i \rightarrow \end{array}$$

⑤ Solving by Finding Square Roots

ex) $3x^2 + 48 = 0$

ex) $3x^2 + 1 = x^2 - 1$

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

ex) $x^2 + 16 = -49$

⑥ Simplifying each expression. (5.6)
* Make sure to change mode on the calculator.

a) $(9 - 2i) + (6 + 3i)$

b) $(8 + 3i) - (2 + 4i)$

c) $7 - (3 + 2i)$

d) $(12i)(7i)$

e) $(6 - 5i)(4 - 3i)$

f) $(2 + \sqrt{-1}) + (-3 + \sqrt{-16})$

g) $(-2 + \sqrt{-9})(6 + \sqrt{-25})$

h) $2i(5 - 3i)$

5.7 Completing the Square

Use this method to solve a quadratic equation when _____, and its _____ and we want an exact answer

Steps:

1st: move

2nd: add

3rd: Factor the Left side into

4th: square root both sides

5th: solve for x

(ex) $x^2 + 6x = 25$

Always see if it is

1st.

(ex) $x^2 - 3x = 28$

(ex) $x^2 - 4x + 7 = 0$

$$\textcircled{\text{ex}} \quad x^2 + 6x + 41 = 0$$

$$\textcircled{\text{ex}} \quad x^2 - 2x - 63 = 0$$

$\textcircled{\text{ex}}$

5.8 Quadratic Formula & The Discriminant

Day _____

Use the quadratic formula if it is _____ and _____. To use the formula, the equation must be in _____ form, _____.

The Quadratic Formula is \rightarrow

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

The discriminant is the part under the square root,

_____. Always find this 1st!

It tells you how many _____, _____
_____, _____

IF $B^2 - 4AC$ is...

①

②

③

Find the Discriminant. Determine the #
OF Solutions.

5.8

WKST

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

#7) $2x^2 = 4x - 3$

#11) $\frac{1}{3}x^2 + 3 = 2x$

Solve by the Quadratic Formula

#) $2x^2 - 7x + 5 = 0$

ch. 5 p. 29

$$\textcircled{\text{I.}} \quad x^2 - 6x + 4 = 0$$

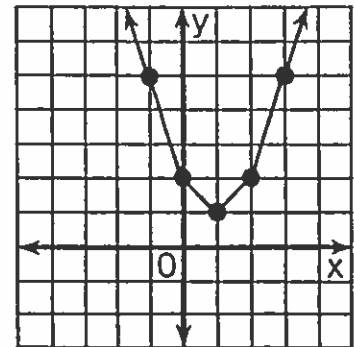
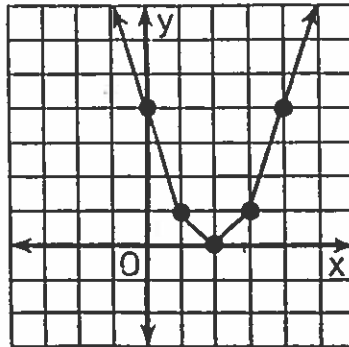
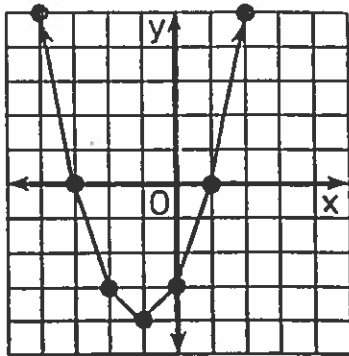
$$\textcircled{\text{G.}} \quad 6x^2 - x = 2$$

$$\textcircled{\text{I.}} \quad x^2 + 9 = -9x$$

$$\textcircled{\text{N.}} \quad 3x^2 + 10x + 5 = 0$$

How Can You Help Control Soil Erosion?

Use the related graph or the discriminant of each equation to determine how many real-number solutions it has. Circle the letter of the correct choice and write this letter in the box containing the exercise number. **Equation must be in standard form to find the discriminant*



- ① $x^2 + 2x - 3 = 0$
 (D) two solutions
 (E) one solution
 (M) no solutions

- ② $x^2 - 4x + 4 = 0$
 (C) two solutions
 (A) one solution
 (W) no solutions

- ③ $x^2 - 2x + 2 = 0$
 (H) two solutions
 (D) one solution
 (O) no solutions

	value OF $B^2 - 4AC$	two solutions	one solution	no solutions							
④ $x^2 + 5x + 4 = 0$		K	B	G							
⑤ $x^2 - 3x = 2$		U	O	A							
⑥ $y^2 + 10y + 25 = 0$		V	A	I							
⑦ $2x^2 = 4x - 3$		F	C	H							
⑧ $4x^2 + 9 = 12x$		S	P	N							
⑨ $-3n^2 + 5n - 2 = 0$		N	R	S							
⑩ $\frac{1}{2}x^2 + 3x + 8 = 0$		R	P	L							
⑪ $\frac{1}{3}t^2 + 3 = 2t$		Y	B	T							
	7	3	10	1	5	8	2	11	6	9	4

