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IM2 Semester 1 Final Exam Review G
(Study Guide Questions 64-72)

Converting Equations and Graphing Quadratics

To rewrite a quadratic from modified vertex form into standard form (problems 64–66):

Start by rewriting the $(something)^2$ as $(something)(itself)$.

Leave the number at the end (k) where it is. You will add or subtract it last.

Next, distribute every part of the first parentheses with every part of the second parentheses.

If you did this step correctly, you will have 4 terms (and one extra (the "k") hanging out in the back).

Lastly, combine like terms to write the equation in the form $f(x) = ax^2 + bx + c$.

Add or subtract terms with the same variables (x^2 & x^2, x & x, $number$ & $number$).

1. Rewrite the quadratic equation in standard form. $f(x) = (7x + 4)^2 + 1$	2. Rewrite the quadratic equation in standard form. $f(x) = (2x - 8)^2 + 3$	3. Rewrite the quadratic equation in standard form. $f(x) = (9x - 8)^2 - 5$
4. Rewrite the quadratic equation in standard form. $f(x) = (6x - 5)^2 - 2$	5. Rewrite the quadratic equation in standard form. $f(x) = (5x + 1)^2 - 4$	6. Rewrite the quadratic equation in standard form. $f(x) = (8x + 2)^2 + 3$
7. Rewrite the quadratic equation in standard form. $f(x) = (2x - 9)^2 - 3$	8. Rewrite the quadratic equation in standard form. $f(x) = (6x - 1)^2 - 2$	9. Rewrite the quadratic equation in standard form. $f(x) = (3x + 8)^2 + 9$

To complete the square to find *p* and *q* (problems 67–69):

There are two ways to solve this problem.

OPTION 1:

Determine the vertex to write the problem in vertex form.

$h = -\frac{b}{2a}$, *then plug h in for all the x-values in the original equation to find k.*

Rewrite the problem in the form $a(x - h)^2 + k = 0$

Then, move k to the other side by adding or subtracting it.

Identify p & q based off of the equation $(x - p)^2 = q$

Basically, $p = h$, and $q = -k$ (switch k's sign).

OPTION 2 *(see #19-27 on Review F)*:

Start by moving c to the other side of the equal sign.

Then, rewrite $x^2 + bx = -c$ as $\left(x + \frac{b}{2}\right)^2 = -c + \left(\frac{b}{2}\right)^2$

Divide the number in front of the x-term by 2. Write that number in squared parentheses on the left:

$$\left(x \boxed{same\ sign} \boxed{number\ divided\ by\ 2}\right)^2 =$$

Whatever number you put on the left, square it and add that number to the number on the right.

Then simplify the right side & identify p & q based off of the equation $(x - p)^2 = q$.

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For example: $x^2 - 100x - 8 = 0$

$x^2 - 100x = 8$ $\quad 100 \div 2 = \boxed{50}$ *&* $(50)^2 = \boxed{2500}$

$(x - \boxed{50})^2 = 8 + \boxed{2500}$

$(x - 50)^2 = 2508$

$\boxed{p = 50, q = 2508}$

10. The equation $x^2 + 10x + 1 = 0$ can be transformed into an equation of the form $(x - p)^2 = q$, where p and q are rational numbers. Complete the table below with the values of p and q.

Constant	Value
p	
q	

11. The equation $x^2 - 6x - 24 = 0$ can be transformed into an equation of the form $(x - p)^2 = q$, where p and q are rational numbers. Complete the table below with the values of p and q.

Constant	Value
p	
q	

12. The equation $x^2 + 18x - 5 = 0$ can be transformed into an equation of the form $(x - p)^2 = q$, where p and q are rational numbers. Complete the table below with the values of p and q.

Constant	Value
p	
q	

13. The equation $x^2 + 6x + 15 = 0$ can be transformed into an equation of the form $(x - p)^2 = q$, where p and q are rational numbers. Complete the table below with the values of p and q.

Constant	Value
p	
q	

14. The equation $x^2 - 8x + 23 = 0$ can be transformed into an equation of the form $(x - p)^2 = q$, where p and q are rational numbers. Complete the table below with the values of p and q.

Constant	Value
p	
q	

15. The equation $x^2 + 34x + 2 = 0$ can be transformed into an equation of the form $(x - p)^2 = q$, where p and q are rational numbers. Complete the table below with the values of p and q.

Constant	Value
p	
q	

16. The equation $x^2 + 20x - 13 = 0$ can be transformed into an equation of the form $(x - p)^2 = q$, where p and q are rational numbers. Complete the table below with the values of p and q.

Constant	Value
p	
q	

17. The equation $x^2 - 22x - 17 = 0$ can be transformed into an equation of the for m $(x - p)^2 = q$, where p and q are rational numbers. Complete the table below with the values of p and q.

Constant	Value
p	
q	

18. The equation $x^2 - 12x + 4 = 0$ can be transformed into an equation of the form $(x - p)^2 = q$, where p and q are rational numbers. Complete the table below with the values of p and q.

Constant	Value
p	
q	

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To graph a quadratic in vertex form (problems 70-72):

Start by determining your vertex (h, k), which is given to you in vertex form: $f(x) = a(x - h)^2 + k$.
Graph that point.
You need a minimum of 5 points. You **must have** the vertex and cross or touch both the *x*- and the *y*-axes.

The only reasons for your graph not to cross both axes would be

1. *If the provided graphing space was not big enough to allow you to cross them.*
2. *If the graph can never cross axis (the roots are imaginary).*

There are several ways to find the other points that you need. The process below uses an *xy* table.

x	*y*
3 less	
2 less	
1 less than the vertex *x*	
Vertex *x*	Vertex *y*
1 more than the vertex *x*	
2 more	
3 more	

Same (1 less / 1 more)
Same (2 less / 2 more)
Same (3 less / 3 more)

Put your vertex in the middle of an x-y table
On the x side, include as many x's in both directions as you think you need (move by one each time).

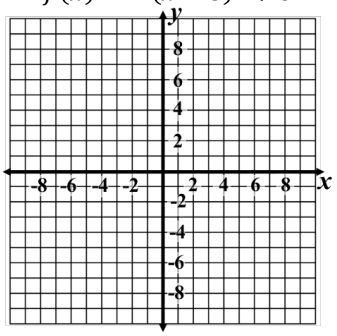
Now, start with one of the x's that is 1 away from the vertex.
Plug it into the original equation. Simplify to get y.
Put that y-value in the table
& copy it to the matching x on the other side of the vertex.
Graph those two points.

Repeat with the x's that are 2 away, and so on until you have touched or crossed each axis.

If your graph looks strange, you have likely made a mistake – go back and check your work.

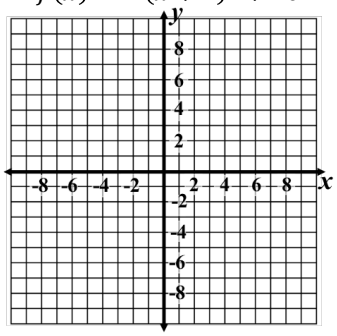
19. Graph. Label the vertex and axis of symmetry.

$f(x) = -(x - 3)^2 + 8$



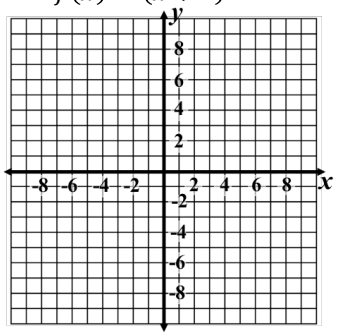
20. Graph. Label the vertex and axis of symmetry.

$f(x) = -(x + 4)^2 + 10$



21. Graph. Label the vertex and axis of symmetry.

$f(x) = (x + 1)^2 - 2$



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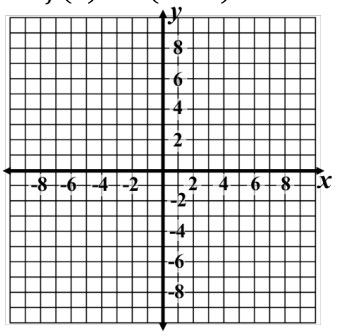
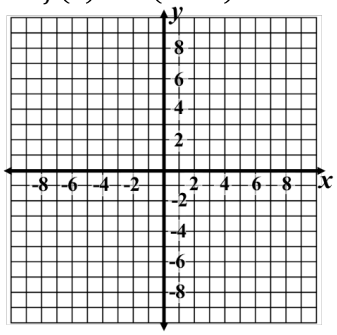
22. Graph. Label the vertex and axis of symmetry.

$f(x) = 2(x-1)^2 - 8$



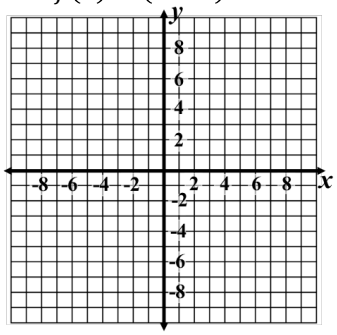
23. Graph. Label the vertex and axis of symmetry.

$f(x) = -(x-4)^2 + 3$



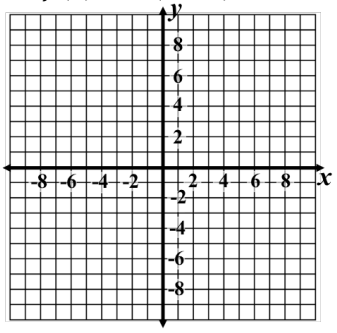
24. Graph. Label the vertex and axis of symmetry.

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



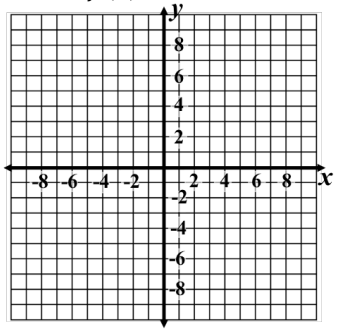
25. Graph. Label the vertex and axis of symmetry.

$f(x) = -(x-2)^2 - 3$



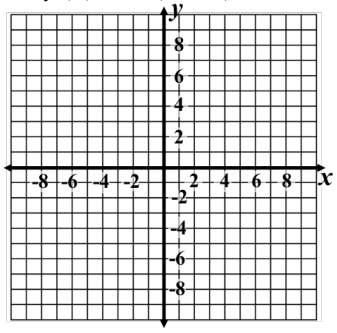
26. Graph. Label the vertex and axis of symmetry.

$f(x) = x^2 - 1$



27. Graph. Label the vertex and axis of symmetry.

$f(x) = -(x+3)^2 + 5$



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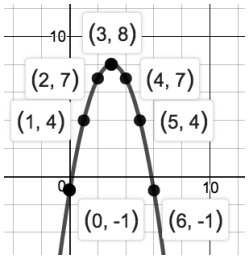
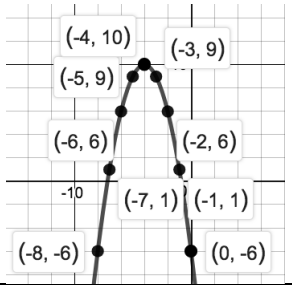
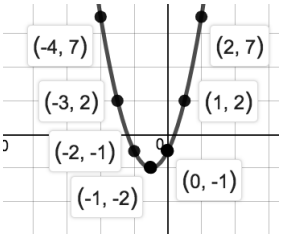
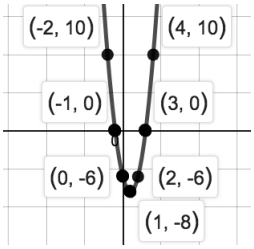
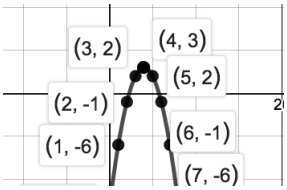
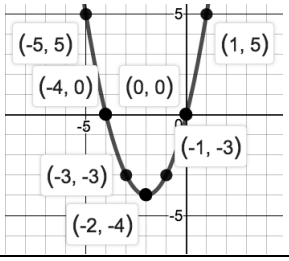
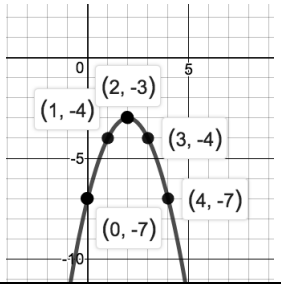
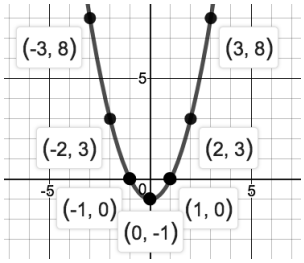
IM2Semester 1 Final Exam Review G Answers

1. $f(x) = 49x^2 + 56x + 17$	2. $f(x) = 4x^2 - 32x + 67$	3. $f(x) = 81x^2 - 144x + 59$
4. $f(x) = 36x^2 - 60x + 23$	5. $f(x) = 25x^2 + 10x - 3$	6. $f(x) = 64x^2 + 32x + 7$
7. $f(x) = 4x^2 - 36x + 78$	8. $f(x) = 36x^2 - 12x - 1$	9. $f(x) = 9x^2 + 48x + 73$
10. $p = -5; q = 24$	11. $p = 3; q = 33$	12. $p = -9; q = 86$
13. $p = -3; q = -6$	14. $p = 4; q = -7$	15. $p = -17; q = 287$
16. $p = -10; q = 113$	17. $p = 11; q = 138$	18. $p = 6; q = -32$
19. 	20. 	21. 
22. 	23. 	24. 
25. 	26. 	27.