Name: _____

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MATH@TD

INTRODUCTION

TO

QUADRATICS

Unit Outline:

a. Properties of Parabolas
b. Zeros form
c. Vertex Form
d. Graphing from Vertex Form
e. Writing Quadratic Relations
f. Completing the Square

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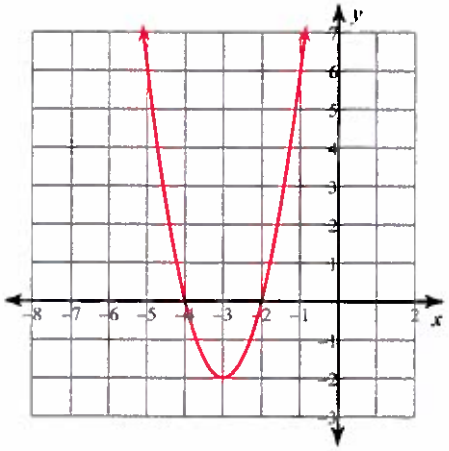
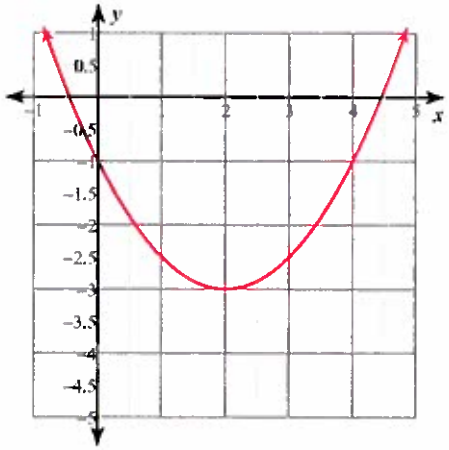
Properties of Parabolas

State the direction of opening, identify the y-intercept, zeros, vertex, AoS, and Max/Min Value.

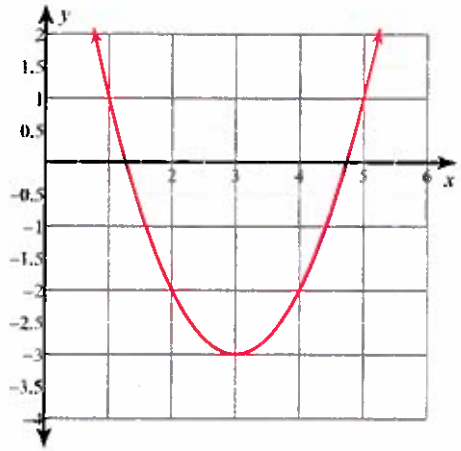
1) $y = 2x^2 + 12x + 16$



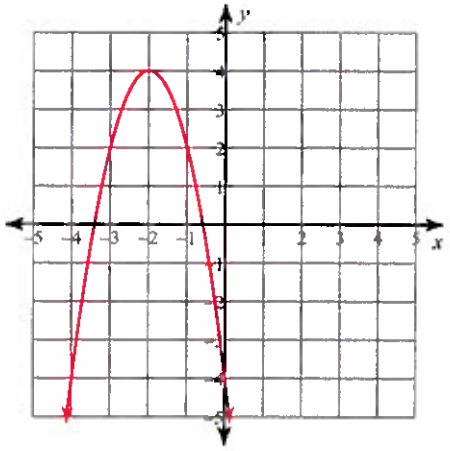
2) $y = \frac{1}{2}x^2 - 2x - 1$



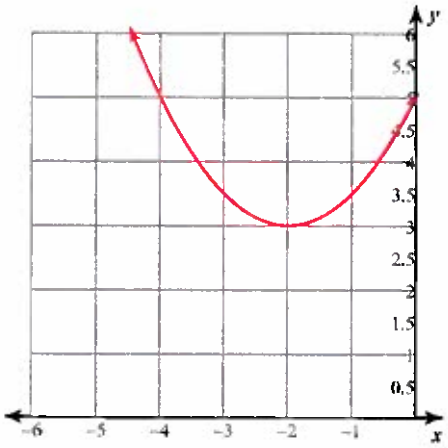
3) $y = x^2 - 6x + 6$



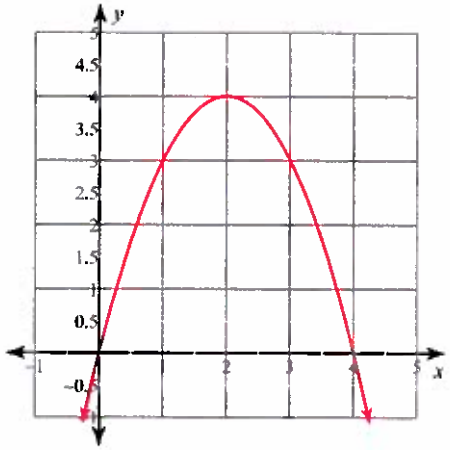
4) $y = -2x^2 - 8x - 4$



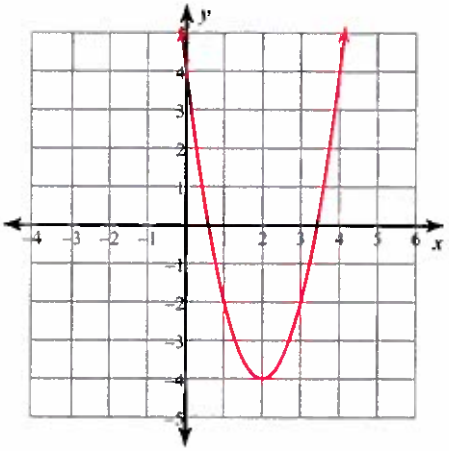
5) $y = \frac{1}{2}x^2 + 2x + 5$



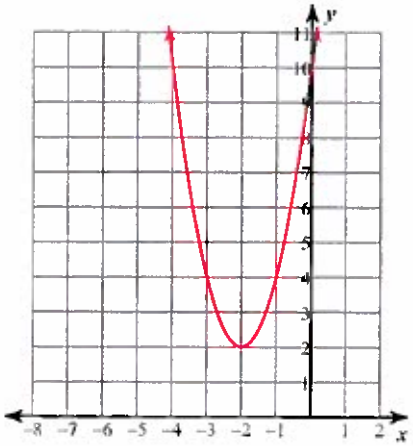
6) $y = -x^2 + 4x$



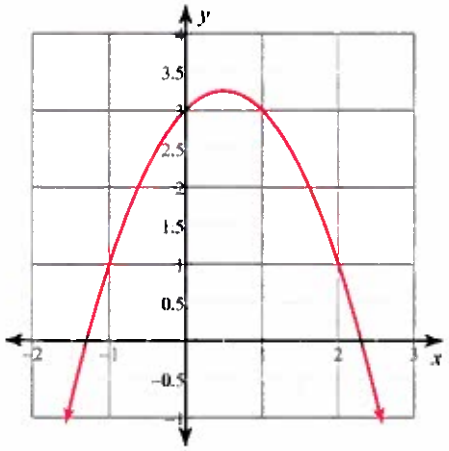
7) $y = 2x^2 - 8x + 4$



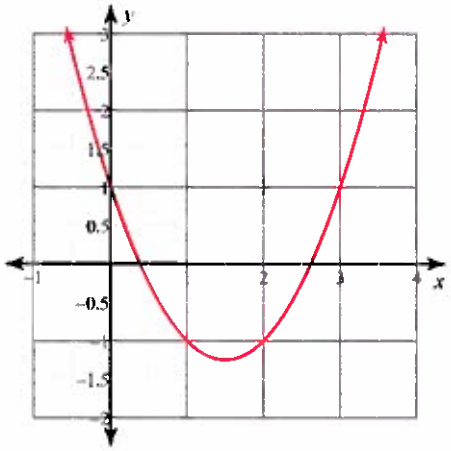
8) $y = 2x^2 + 8x + 10$



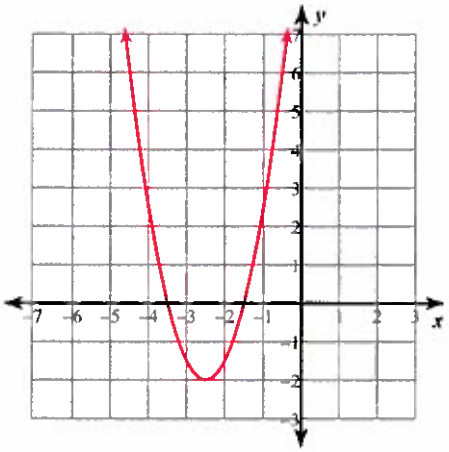
9) $y = -x^2 + x + 3$



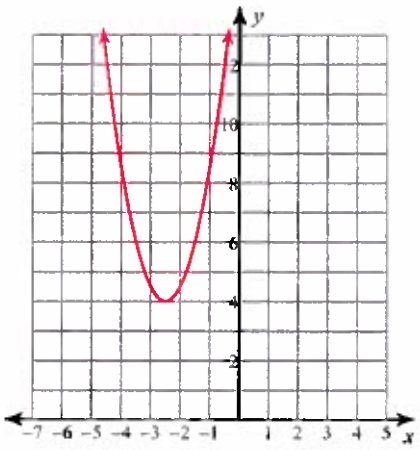
10) $y = x^2 - 3x + 1$



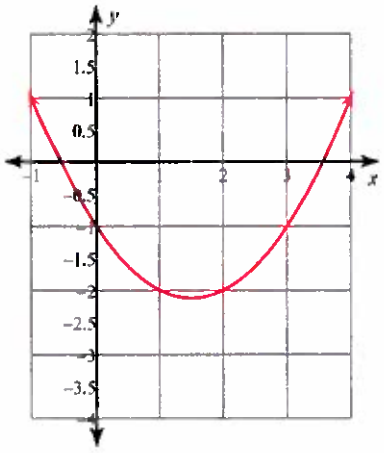
11) $y = 2x^2 + 10x + \frac{21}{2}$



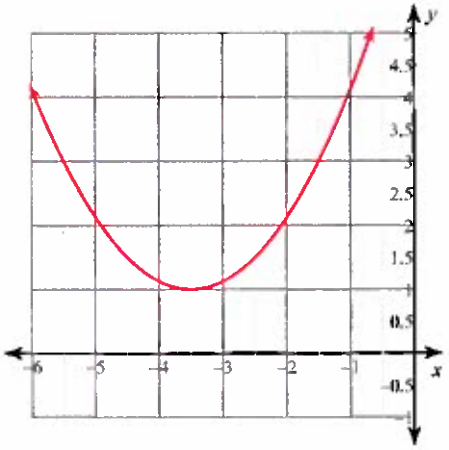
12) $y = 2x^2 + 10x + \frac{33}{2}$



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



14) $y = \frac{1}{2}x^2 + \frac{7}{2}x + \frac{57}{8}$



Use graphing technology (www.desmos.com) to graph the parabola. Then, state the direction of opening, identify the y-intercept, zeros, vertex, AoS, and Max/Min Value.

15) $y = 0.6x^2 - 8.443x + 8.23$

16) $y = 5x^2 - 3x - 5$

17) $y = -100x^2 - 15x + 15$

18) $y = (4 - x)^2 + 3x + 2x^2 - 25$

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Zeros/Factored Form

Convert to Factored/Zeros Form, then state the zeros, AoS and vertex. Sketch #1 and #2

1) $y = x^2 + 6x - 16$

2) $y = -4x^2 + 20x - 16$

3) $y = -4x^2 - 12x$

4) $y = 3x^2 - 15x - 150$

5) $y = 6x^2 - 96$

6) $y = x^2 + 4x - 60$

7) $y = 5x^2 + 18x + 16$

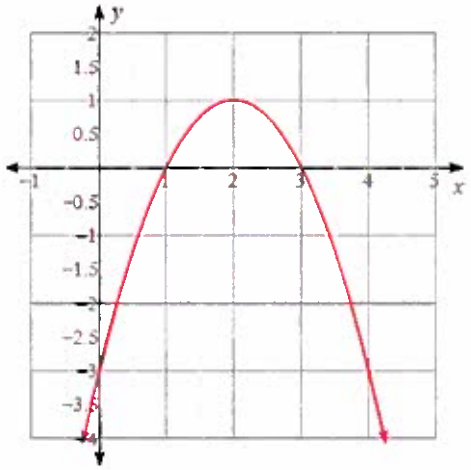
8) $y = 2x^2 - 7x + 5$

9) $y = 8x^2 + 30x + 27$

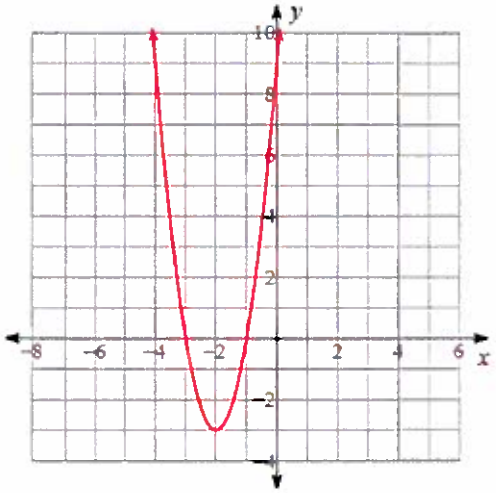
10) $y = -4x^2 + 45x - 50$

Write the parabolas in both Zeros Form and Standard Form.

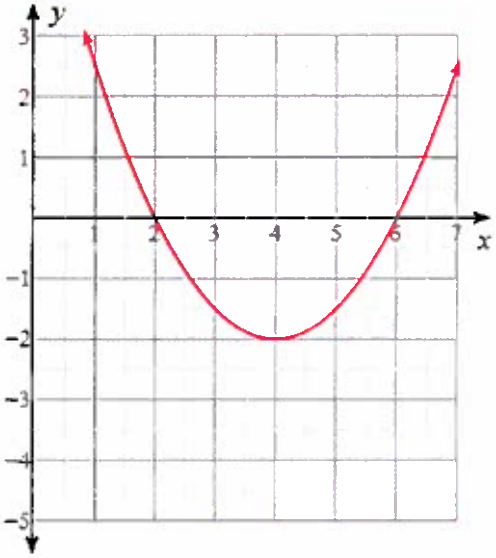
11.



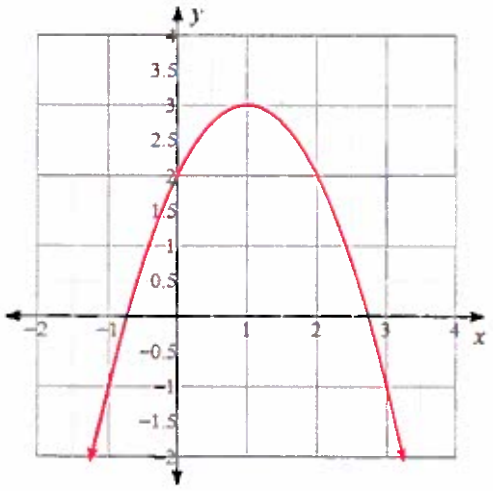
12.



13.



14. Estimate the zeros, but make sure that the average of the zeros is the AoS.



15. Make your own! Your zeros are x=____ and x=____. A point on the graph is (____,____). What is the zeros form?

16. A ball is thrown upwards from the top of an apartment building. The ball reaches a maximum height of 80m after 2 seconds. The ball hits the ground after 6 seconds.

a) Determine the equation, in Zeros Form, of the relation between time and height. Make a sketch.

b) What height is the ball thrown from?

c) What are the zeros and what do they represent?

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Vertex Form

Identify the vertex, axis of symmetry, direction of opening, and y-intercept of each.

1) $y = -8(x-3)^2 - 1$

2) $y = 2(x+3)^2 + 7$

3) $y = -\frac{1}{17}(x+1)^2 + 8$

4) $y = 3(x-6)^2 + 4$

Convert from Vertex Form to Standard Form by expanding.

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

6) $y = -(x+8)^2 - 5$

7) $y = -\frac{1}{11}(x-5)^2 - 4$

8) $y = -2(x-3)^2 - 9$

9) $y = 2(x+9)^2 + 3$

10) $y = 7(x-4)^2 + 1$

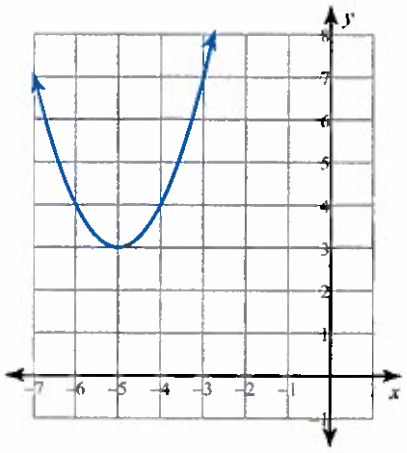
Convert from Standard Form to Vertex Form by finding the zeros, AoS and the vertex.

11) $y = 3x^2 - 12x - 96$

12) $y = -2x^2 - 14x - 20$

State the vertex and another point, then write the vertex form equation of the parabola.

13)



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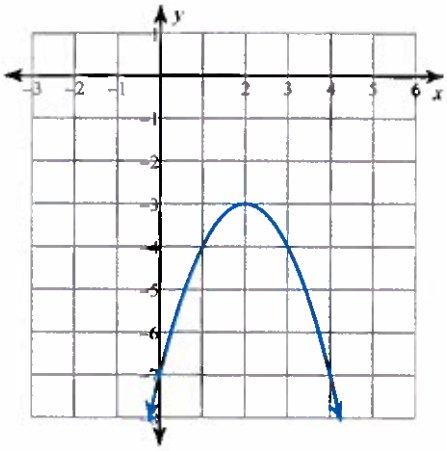
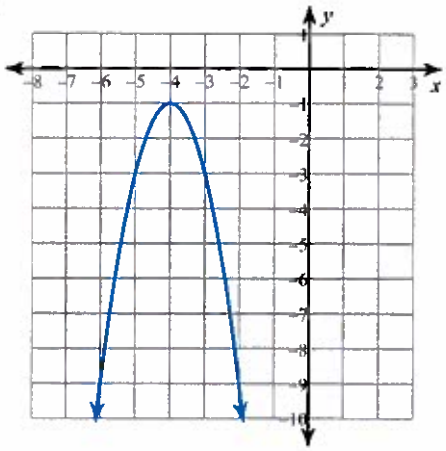
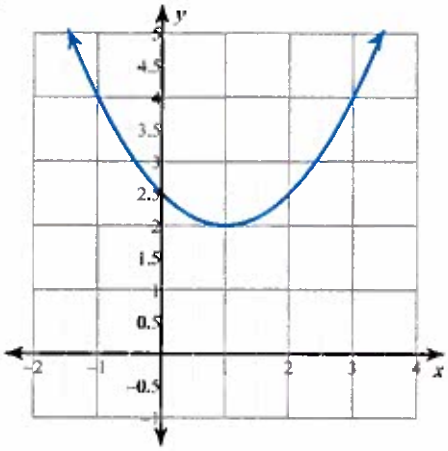


15)



16)



17) A potato is shot out of a potato gun. After 5 seconds, the potato reaches a maximum height of 400ft. The potato mashes into the ground after 10 seconds. Determine the equation, in vertex form, that represents the path of the potato.

Writing Quadratic Relations

Given the following information, write an equation to describe the relationship.

1. Vertex $(3, -2)$ and passes through $(3,\ 8)$.

2. Zeros at 2 and 5, and a *y*-intercept of -2.

3. Passes through $(2,\ 3)$ and $(-4,\ 3)$ and a maximum of 6.

4. A minimum of $(6,\ -2)$ and a zeros at $x = 3$.

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

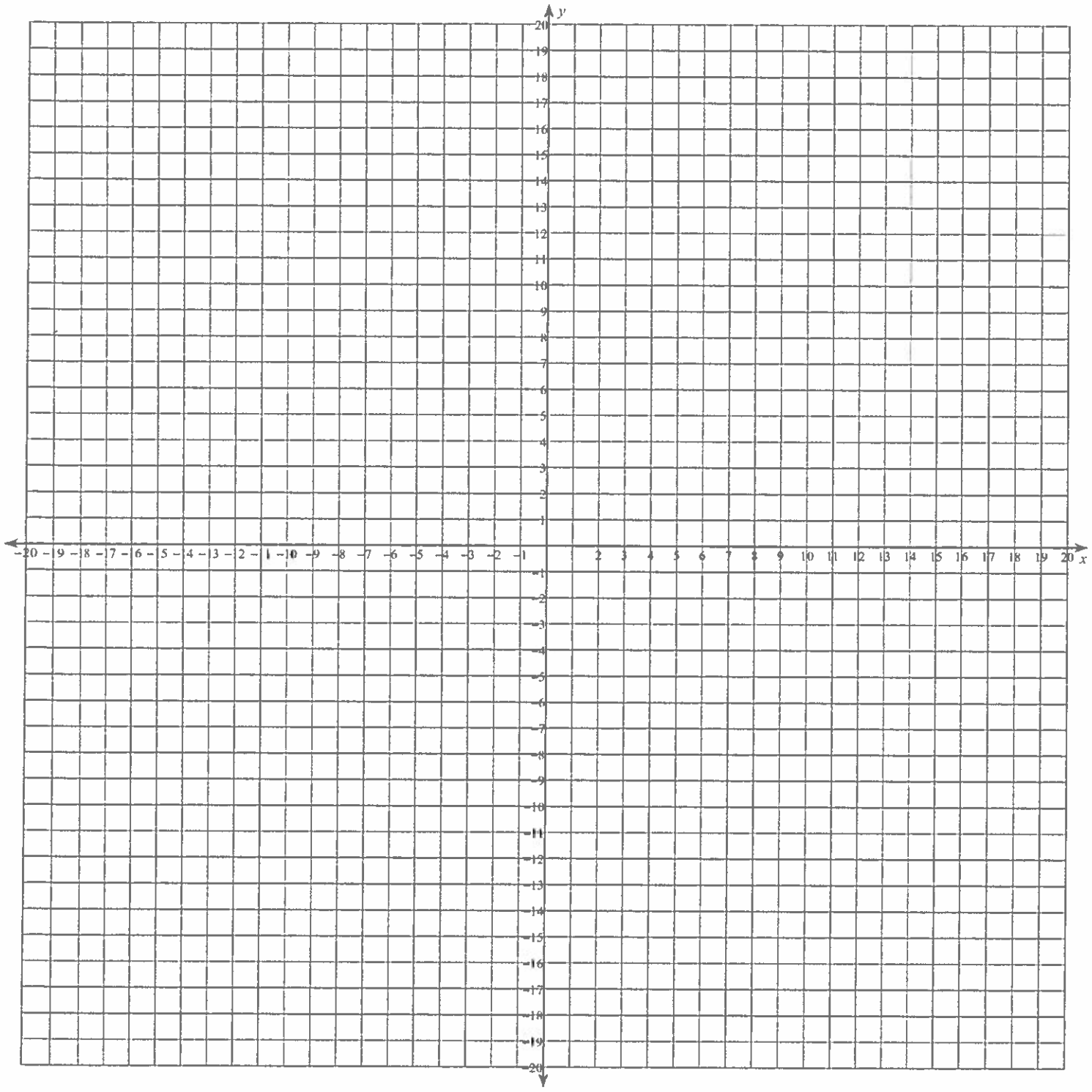
For each question, list the transformations and create the necessary table of values. Then, graph the final result on the provided graph paper, labelling the axis of symmetry, vertex and 3 important points.

1. $y = 2(x - 3)^2 + 6$

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

3. $y = \frac{1}{2}(x - 8)^2 - 10$

4. $y = -\frac{2}{3}(x + 9)^2 + 8$

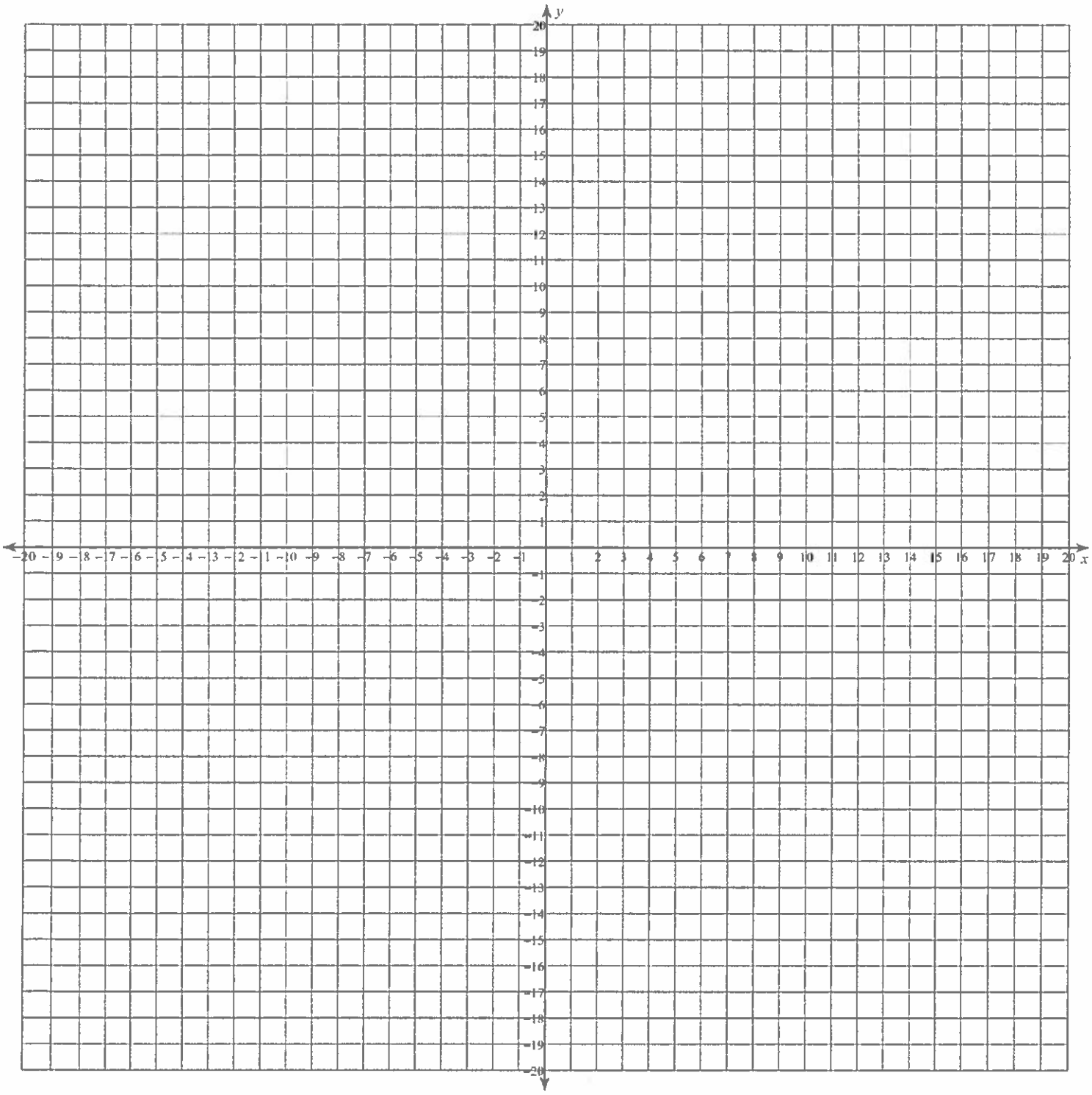

y
x

5. $y = -4x^2 - 5$

6. $y = \frac{3}{5}(x - 7)^2$

7. $y = \frac{3}{2}(x - 12)^2 - 15$

8. $y = 2x^2 + 20x + 39$ (First put it in vertex form)


y
x

Complete the square.

Convert to Vertex Form by Completing the Square. State the vertex.

1. $y = 3x^2 + 24x - 10$

2. $y = -10x^2 + 180x - 807$

3. $y = \frac{1}{2}x^2 - 2x - 3$

4. $y = \frac{2}{3}x^2 + 16x$

5. $y = -9x^2 - 54x - 22$

6. $y = -2.5x^2 - 35x - 100$

7. $y = 4x^2 + 12x - 7$

8. $y = -3x^2 + 15x - 8$

9. $y = -1.2x^2 - 4.8x + 3.1$

10. $y = 3.62x^2 + 9.24x + 7.46$

Applications:

11. The Profit margins of a company, where P is profit in thousands, and x is the number of employees, can be modelled by $P = 0.01x^2 - 0.3x + 5$..

Convert the following to Vertex form by Completing the Square. Then, using the appropriate table of values, graph the parabola below.

12. $y = -2x^2 + 4x + 1$

13. $y = \frac{1}{2}x^2 + 4x + 5$