Finding the axis of symmetry, vertex, and roots of a parabola

1)   *Find the <u>Axis of Symmetry</u> of $y = x^2 -4x + 3$ (The AOS is the vertical line that splits the parabola in 2 equal parts)*

Axis of Symmetry ➔ $x = \dfrac{-b}{2a}$

Axis of Symmetry: x = -b . x = -(-4). x = 4 .   **x = 2**   **A.O.S. x =2**
                          2a   2(1)   2

[a is the coefficient of x^2 (1)
and b is the coef. of x (-4)]
    a = 1 b = -4

2)   *Find the <u>vertex</u> of $y = x^2 + 4x + 3$*   *(The vertex is the turning point)*

 Finding the vertex: If the axis of symm. is an integer, then you can find the ordered
        pair for the vertex in the table. If not, we will use the calculator.

2nd CALC 1 (for value)   Type in the value for x (x= 2) and hit   ENTER

The ordered pair for the vertex will appear on the bottom of the screen. **(2,-1)**   **Vertex: ($2, -1$)**

3)   *Find the <u>roots</u> of $y = x^2 + 4x + 3$ (The roots are where the parabola crosses the x-axis)*

Finding the roots: The roots are where the equation or y = 0. (Where it crosses the x-axis).
                This is why we put y = 0 into the calculator. The x-axis is y = 0.

There are usually 2 roots. To find the first:

2nd CALC 5 (for intersect) ENTER   ENTER   ENTER
The ordered pair will be at the bottom.   (1,0)   **Root #1: (1, 0)**

                To find the 2nd root:

2nd CALC 5 (for intersect)   **DO NOT HIT ENTER!!!!!**
You must move the cursor using the blue left and right arrows (not up and down) close to the 2nd root.
Once close: *ENTER   ENTER   ENTER*   The ordered pair will be at the bottom. (3,0)

                                Root #2: (3,0)

1) *Find the <u>Axis of Symmetry</u> of y = -3x² + x + 2 (The AOS is the vertical line that splits the parabola in 2 equal parts)*

Axis of Symmetry → $x = \dfrac{-b}{2a}$

<u>Axis of Symmetry:</u>   x = $\dfrac{-b}{2a}$ x = $\dfrac{-(1)}{2(-3)}$ X = $\dfrac{-1}{-6}$ **A.O.S.= x = $\dfrac{1}{6}$**

[a is the coefficient of x² (-3)and b is the coef. of x (1)]

2) *Find the <u>vertex</u> of y = -3x² + x + 2*   *(The vertex is the turning point)*

<u>Finding the vertex</u>:   If the axis of symm. is an integer, then you can find the ordered pair for the vertex in the table. If not, we will use the calculator.

2nd CALC   1   (for value)   Type in the value for x= ($\dfrac{1}{6}$) and hit   ENTER

The ordered pair for the vertex will appear on the bottom of the screen. (.166666667, 2.08333333333)

Vertex: ($\dfrac{1}{6}$, $\dfrac{25}{12}$)

3) *Find the <u>roots</u> of y = 3x² + x + 2 (The roots are where the parabola crosses the x-axis)*

<u>Finding the roots:</u>
       The roots are where the equation or y = 0. (Where it crosses the x-axis).
       This is why we put y = 0 into the calculator. The x-axis is y = 0.

       There are usually 2 roots. To find the first:
2nd CALC   5   (for intersect) ENTER   ENTER   ENTER
The ordered pair will be at the bottom.   **Root #1: ($\dfrac{-2}{3}$, 0)**

       To find the 2nd root:
2nd CALC   5   (for intersect)   DO NOT HIT ENTER!!!!!
       You must move the cursor using the blue left and right arrows (not up and down) close to the 2nd root. Once close: ENTER   ENTER   ENTER   The ordered pair will be at the bottom.

Root #2: (1,0)

For each parabola find the axis of symmetry, vertex, and roots: DO NOT ROUND!!

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

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

AOS: x = _____

AOS: _____

Vertex: _____

Vertex: _____

Roots: _____ and _____

Roots: _____ and _____

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

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

AOS: x = _____

AOS: _____

Vertex: _____

Vertex: _____

Roots: _____ and _____

Roots: _____ and _____

For 5-8: Round all answers to the nearest hundredth:

5) $y = 3x^2 + 2x - 4$ 6) $y = -2x^2 - 5x + 1$

AOS: x = _____   AOS: _____

Vertex: _____   Vertex: _____

Roots: _____ and _____   Roots: _____ and _____

7) $y = -4x^2 + 5x$ 8) $y = x^2 - 8$ (be careful… what's b equal to?)

AOS: x = _____   AOS: _____

Vertex: _____   Vertex: _____

Roots: _____ and _____   Roots: _____ and _____

1) a) Graph: $y = -x^2 - 2x + 8$
   b) Is the vertex a minimum or maximum?
   c) Find the axis of symmetry.
   d) Find the vertex.
   e) Find the roots.

2) a) Graph: $y = 2x^2 + 2x - 2$
   b) Is the vertex a min. or max.?
   c) Find the axis of symmetry.
   d) Find the vertex.
   e) Find the roots.

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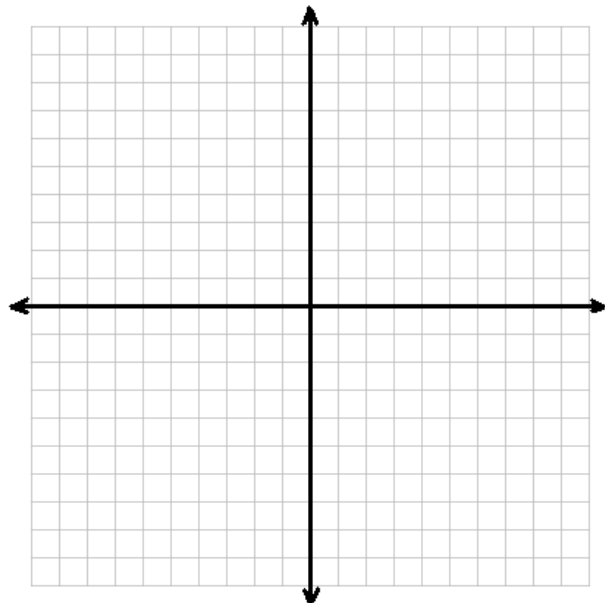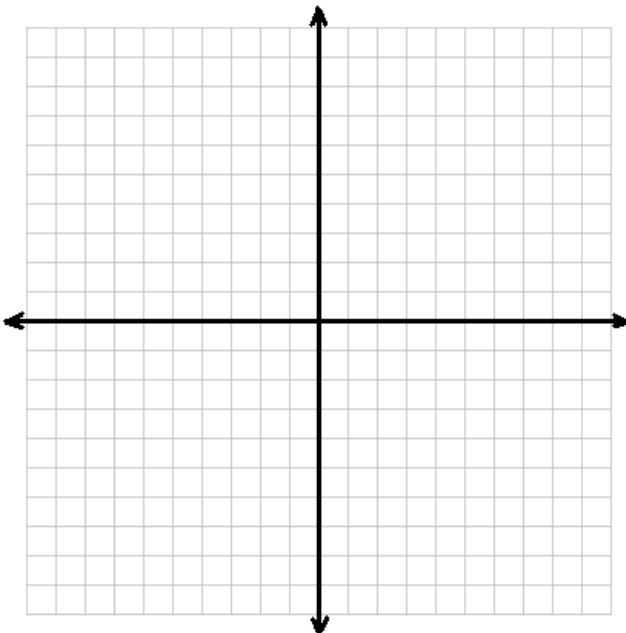
3) a) Graph: $y = x^2 - 3x - 6$
    b) Is the vertex a minimum or maximum?
    c) Find the axis of symmetry.
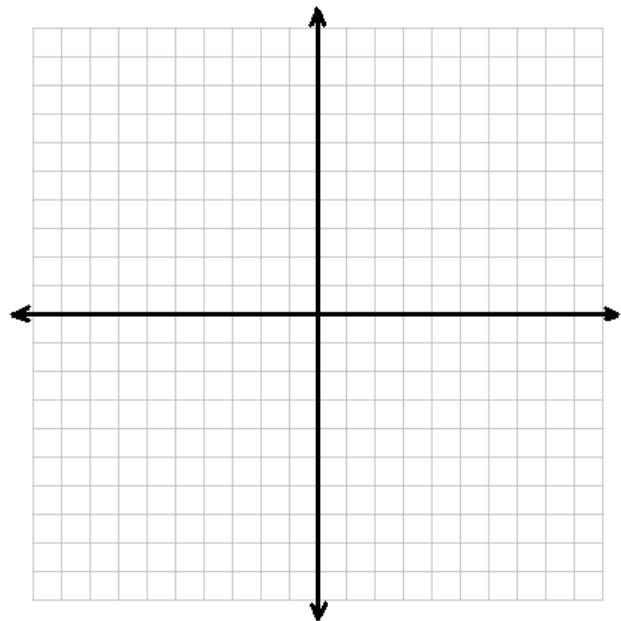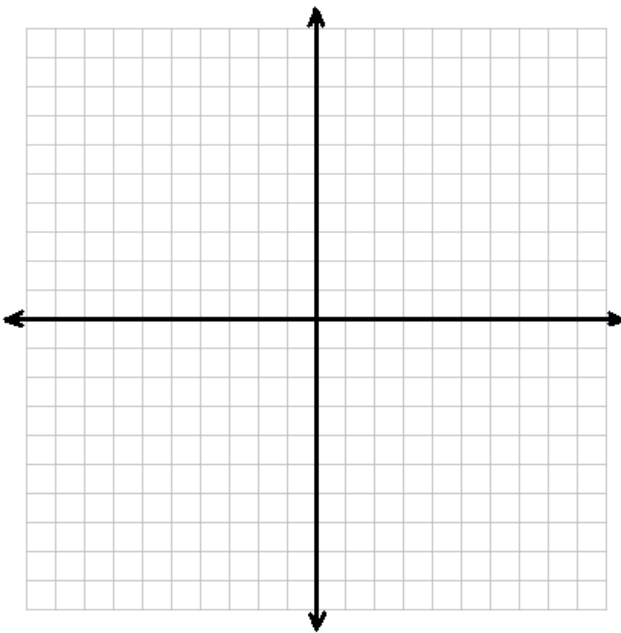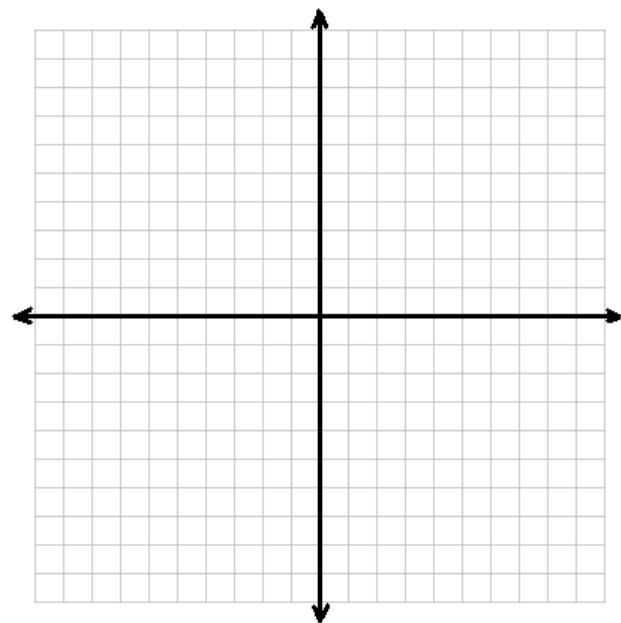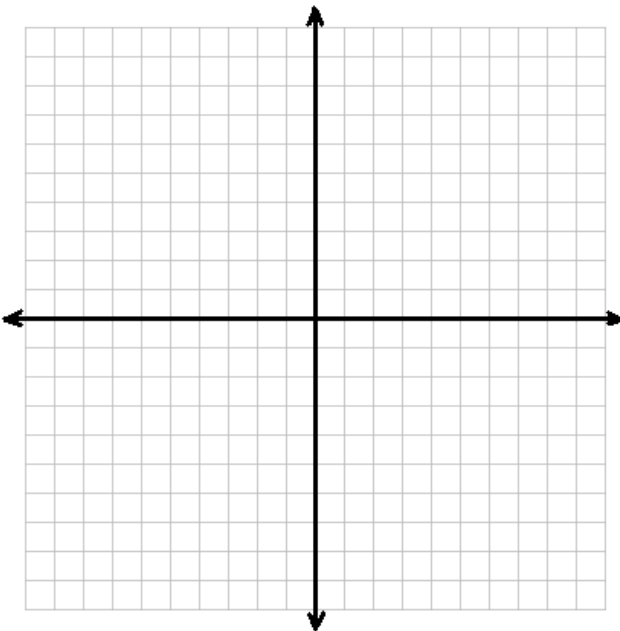   d) Find the vertex.
    e) Find the roots.

4) a) Graph: $y = -3x^2 + x + 2$
    b) Is the vertex a min. or max.?
    c) Find the axis of symmetry.
    d) Find the vertex.
    e) Find the roots.

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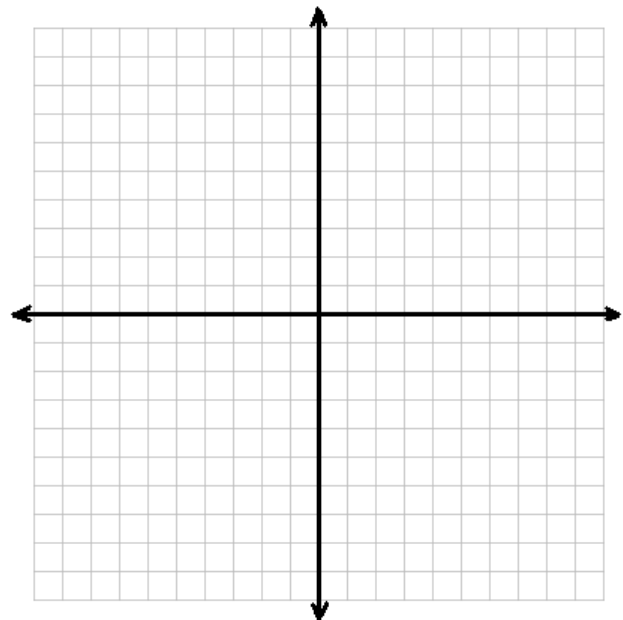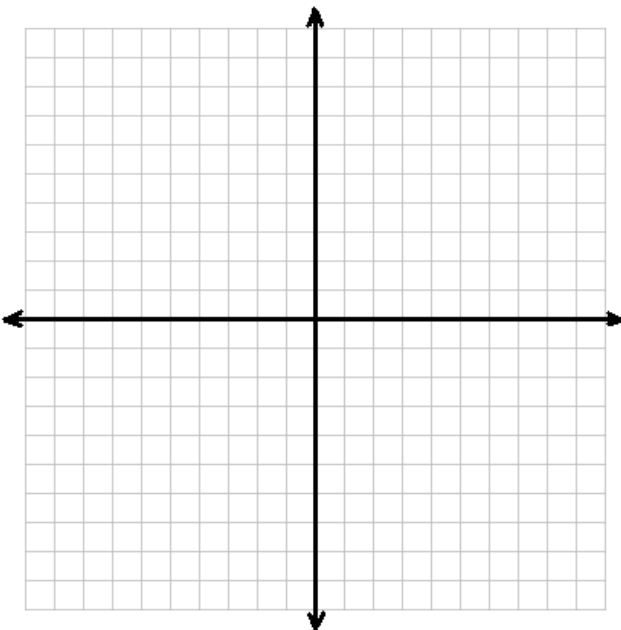
5) a) Graph: $y = 2x^2 + 5x - 3$

   b) Is the vertex a minimum or maximum?

   c) Find the axis of symmetry.

   d) Find the vertex.

   e) Find the roots.

6) a) Graph: $y = -3x^2 - 4x + 3$

   b) Is the vertex a min. or max.?

   c) Find the axis of symmetry.
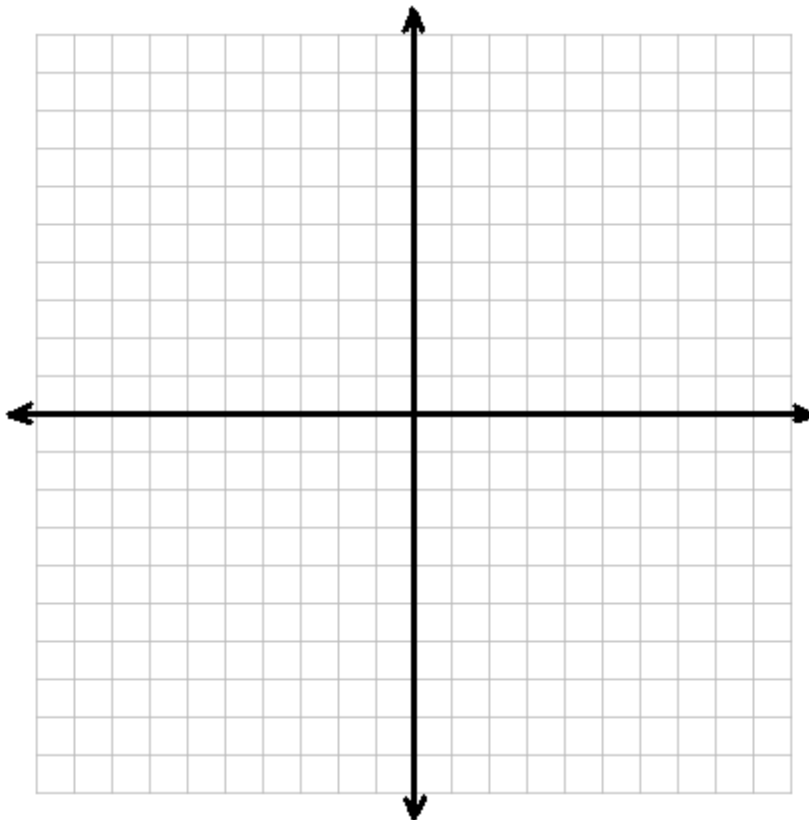
   d) Find the vertex.

   e) Find the roots.

7) a) Graph: $y = -2x^2 + 5x$
   b) Is the vertex a minimum or maximum?
   c) Find the axis of symmetry.
   d) Find the vertex.
   e) Find the roots.

8) a) Graph: $y = x^2 - 7x + 6$
   b) Is the vertex a min. or max.?
   c) Find the axis of symmetry.
   d) Find the vertex.
   e) Find the roots.

1) Solve the system graphically and check:

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

$y + 10 = 3(x + 3)$

2) Solve the system graphically and check:

$y = 2x^2 - 6x$
$20x + 5y = 20$
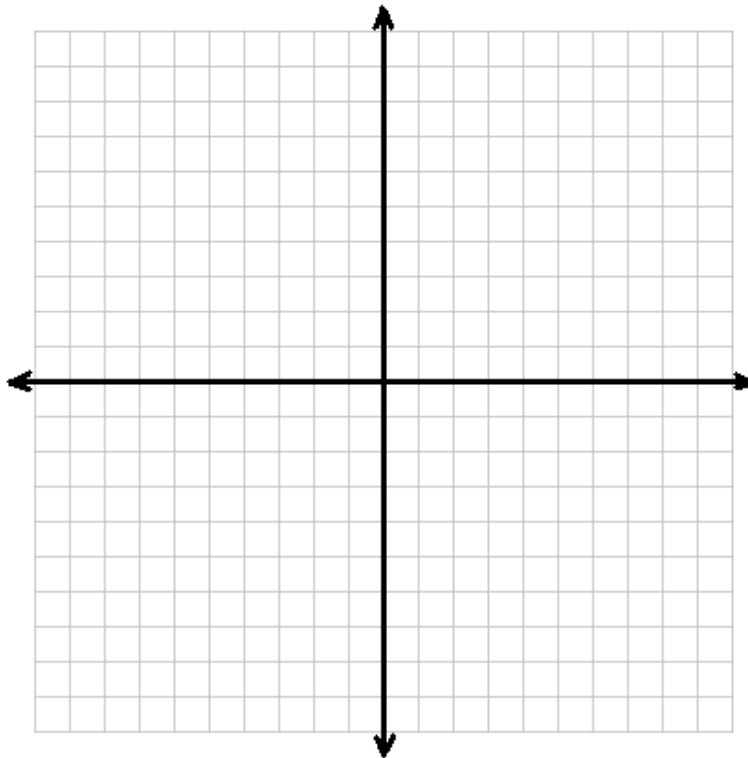
3) Solve the system graphically and check:

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

$y = -3x + 3$
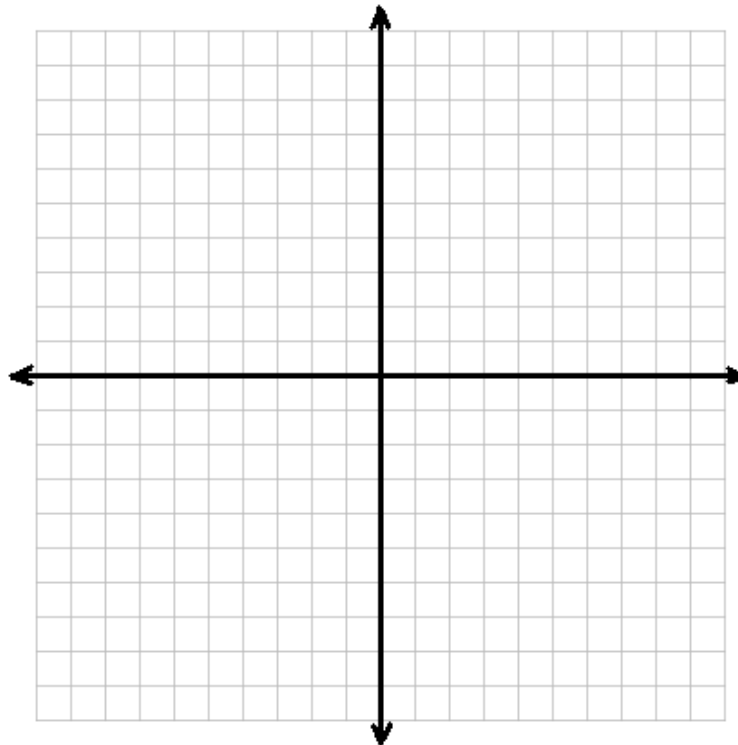
4) Solve the system graphically and check:

$$y = \tfrac{1}{2}\,x^2 - 3x + 3$$
$$y = 2x + 1$$