1. A 4-ounce apple costs $.59. Which is the closest to the cost per pound?

a. $0.15
b. $1.18
c. $2.36
d. $5.90

2. Which value is a solution to the compound inequality?

$3x - 4 < x + 12$ or $4x - 15 > x + 21$

a. 0
b. 8
c. 10
d. 12

Warm Up

A 4 - ounce apple cost $0.59.
Which closest to cost per pound.

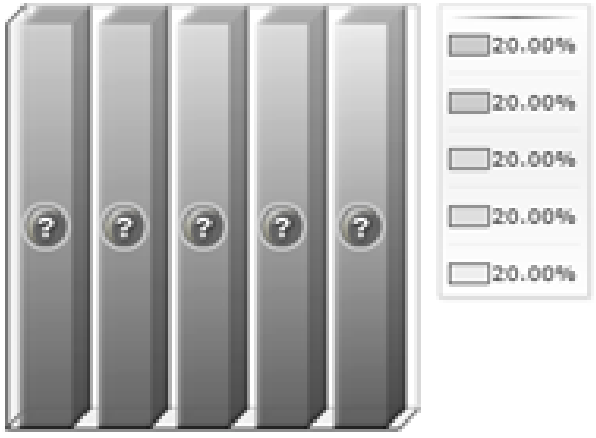
A $0.15

B $1.18

C $2.36

D $5.90

0%



Warm Up

Which value is a solution to the compound inequality?

$3x - 4 < x + 12$ or $4x - 15 > x + 21$

$3x - 4 < x + 12$ or $4x - 15 > x + 21$

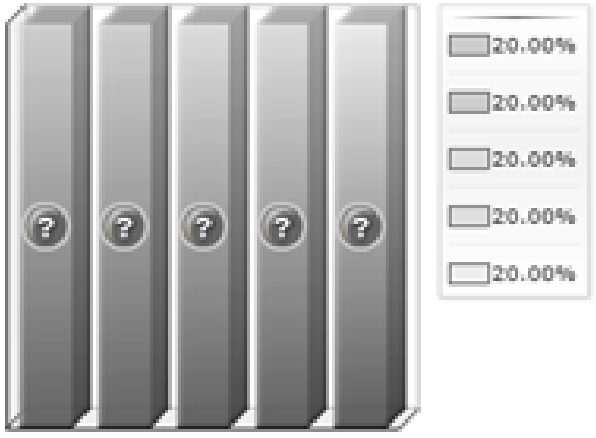
A 0

B 8

C 10

D 12

0%



Warm Up

Graphing and Solving Quadratics

(lessons 9-1 & 9-2 in book)

Goals Algined to the SPIs & Common Core Standards

You will be able to graph a quadratic function.

You will be able to identify the key features of a quadratic function.

Quadratic Function

$y = ax^2 + bx + c$ $\quad a \neq 0$

a = quadratic term
(and leading coefficient)
b = linear term
c = constant

Quadratic Function

Graph is a **parabola**.

U-Shaped

http://www.youtube.com/watch?v=TtzRAjW6KO0

Parabolas in real life:

- parabolic mirror used for heating,
- satellite dish,

- lenses,
- time and distance equations: rockets(military) & path of a thrown objects, catapults.

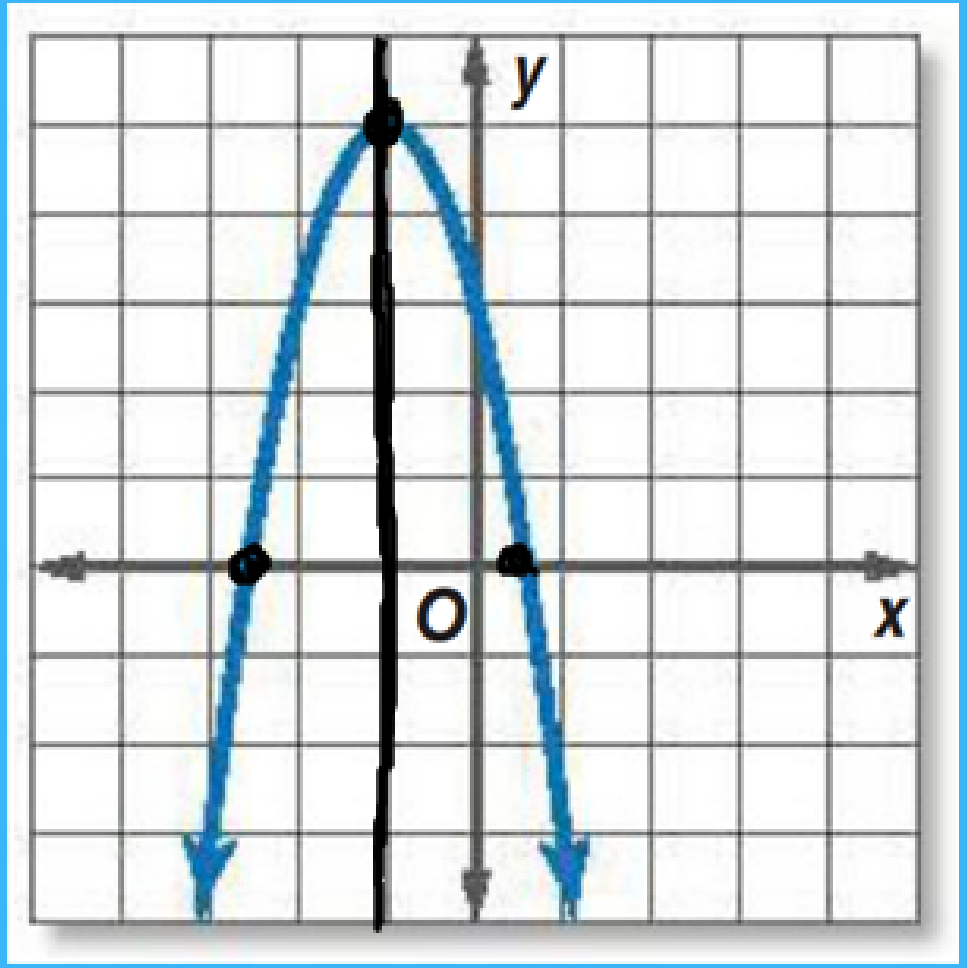
The world's largest solar-thermal complex, Luz International, is located in the Mojave Desert in California. It consists of 1.5 million parabolic mirrors that refect the sun's rays on to tubes filled with oil. The heated oil produces boiled water to produces steam for a turbine.

Does this quadratic have a maximum or minimum value? Maximum

Find the vertex (-1,5)
(min or max coordinate)

y-intercept: 3

x-intercepts: .5 and -2.5
(we also call these zeros, solutions, and roots)



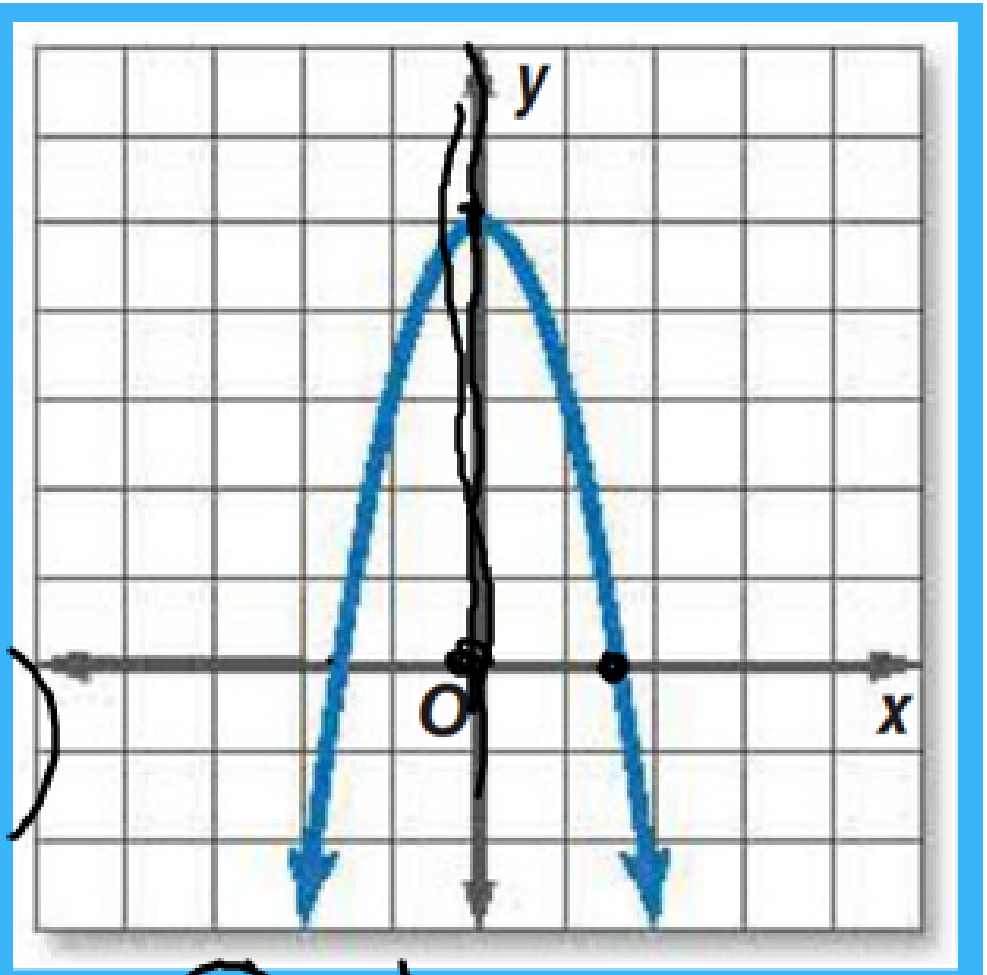
Draw a line through the middle of parabola that if you reflect the parabola over that line, it will be the same:
We call this the axis of symmetry. Can you write the equation of that line? $x = -1$

Max or min: MAX

Vertex: (0, 5)

y-int: 5

zeros: $(1\frac{1}{2}, 0)$, $(-1\frac{1}{2}, 0)$



Axis of symmetry equation: $0 = x$

Domain: All Real #s!

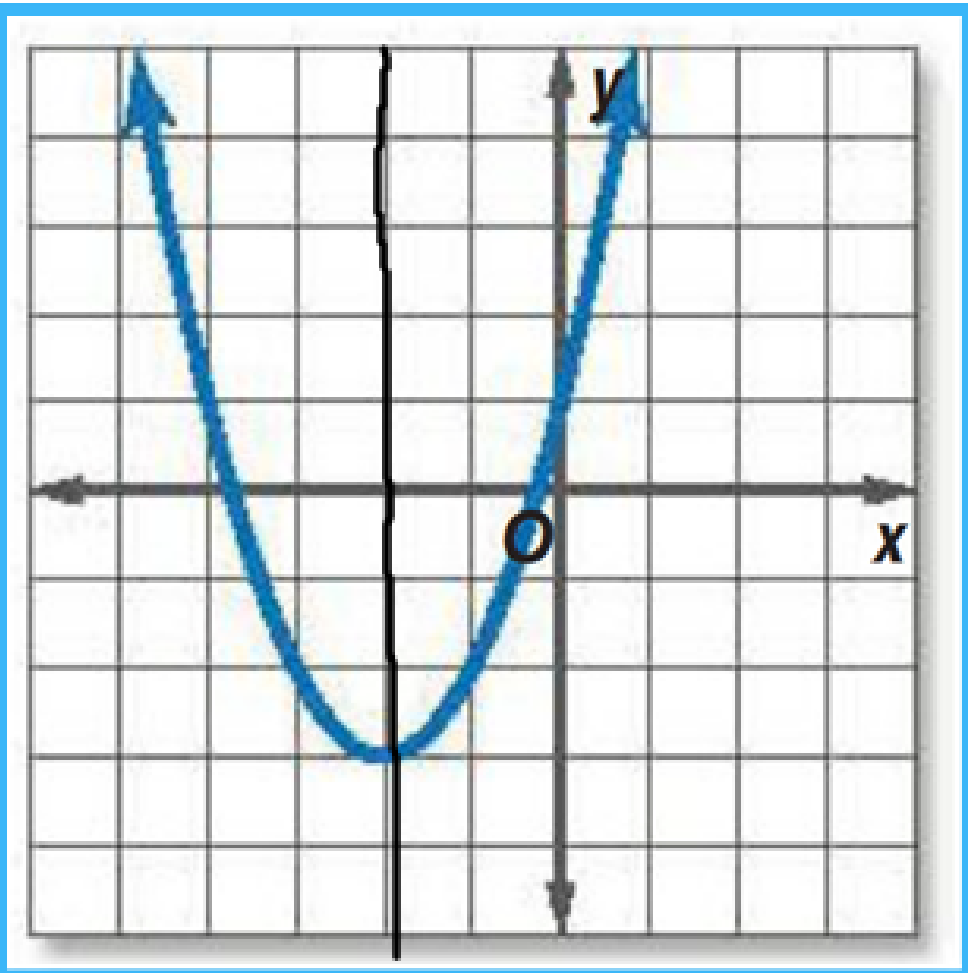
Range: $y \leq 5$

Max or min: min

Vertex: (-2, -3)

y-int: 1

zeros (-3.7, 0) (-.2, 0)



Axis of symmetry equation: $x = -2$

Domain: All Real #s (numbers)

Range: $y \geq -3$

Quadratic Function

x-intercepts are also known as:

- Zeros
- Roots
- Solutions

How to find the key features of a graph from a Quadratic Function.

RULE OF 4!

All parabolas have an **axis of symmetry**.

$$x = \frac{-b}{2a}$$

$$y = ax^2 + bx + c$$

A vertex is not only the minimum or maximum point, it is also the point at which the axis of symmetry intersects a parabola.

x-value: $\frac{-b}{2a}$

y-value: plug in x-value into equation and simplify

$y = ax^2 + bx + c$

$\left(\frac{-b}{2a}, \_\_\_\_\_\right)$

Quadratic Function

Maximum or Minimum Value

If a is positive, vertex is a min.

If a is negative, vertex is a max.

What do you remember about the y-intercept in relation to the x-value?

How can you apply that to find the y-int in a quadratic function?

$y = ax^2 + bx + c$

$y = c$

Examples

Identify the following:

- a, b, and c
- Axis of Symmetry
- Vertex
- Max or Min
- y-int
- Graph (table)
- Zeros
- Domain and Range

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

a = 1 b = 4 c = 3

axis of symmetry

$x = \frac{-b}{2a}$

$x = -\frac{4}{2(1)}$

$x = -2$

vertex

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

$\left(\frac{-b}{2a}, \right)$ $(-2, -1)$

y-int 3

(0, 3)

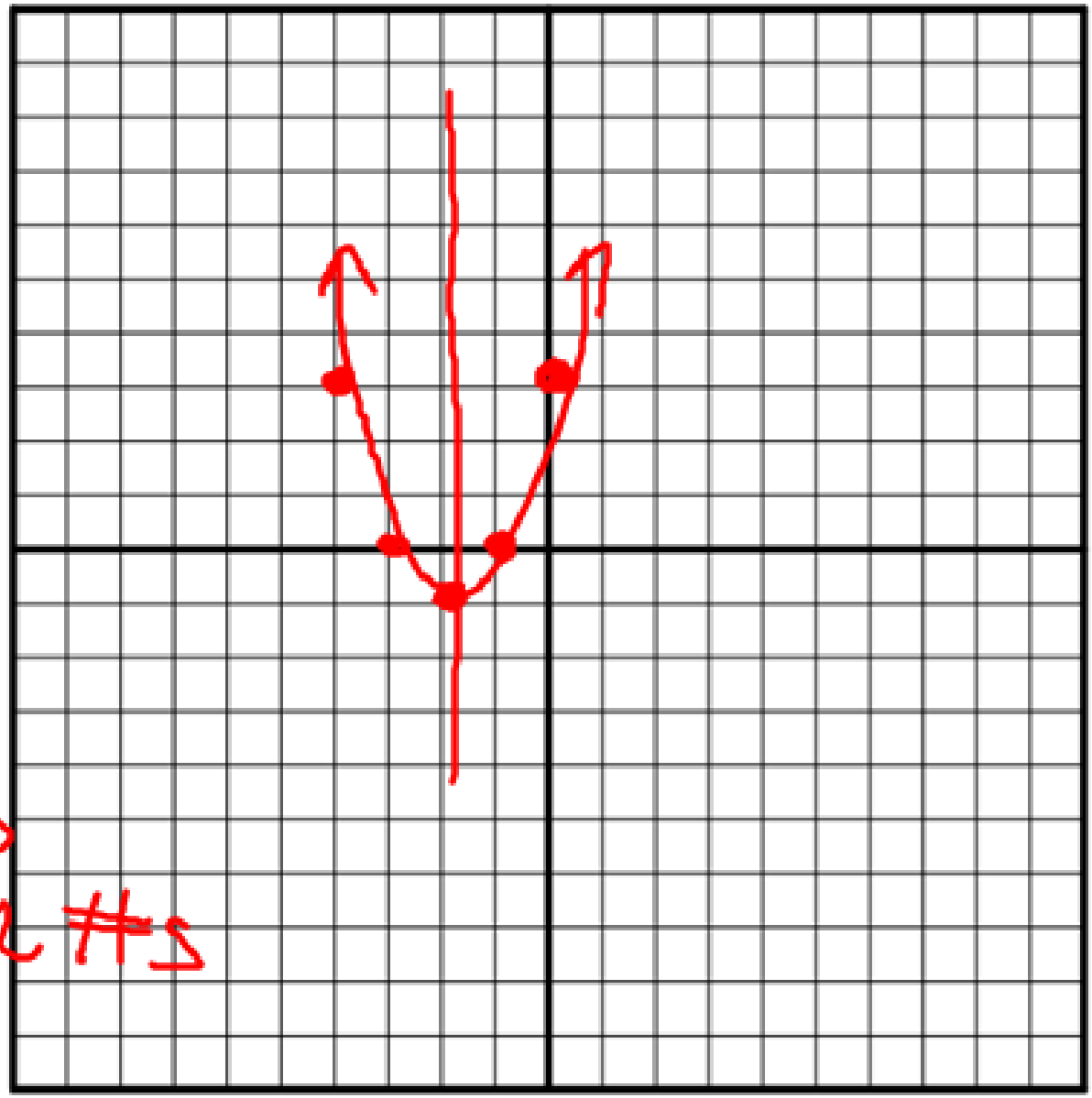
max or min

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

$1 + 4(-1) + 3$

min

x	y
-4	3
-3	0
-2	-1
-1	0
0	3



Zeros: $\{-1, -3\}$

Domain: all real #s

Range: $y \geq -1$

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

a = -1 b = -4 c = -4

axis of symmetry

$x = \frac{4}{2(-1)} = x = -2$

vertex

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

$y = -4 + 8 - 4 = 0$

$(-2, 0)$

y-int -4

max or min

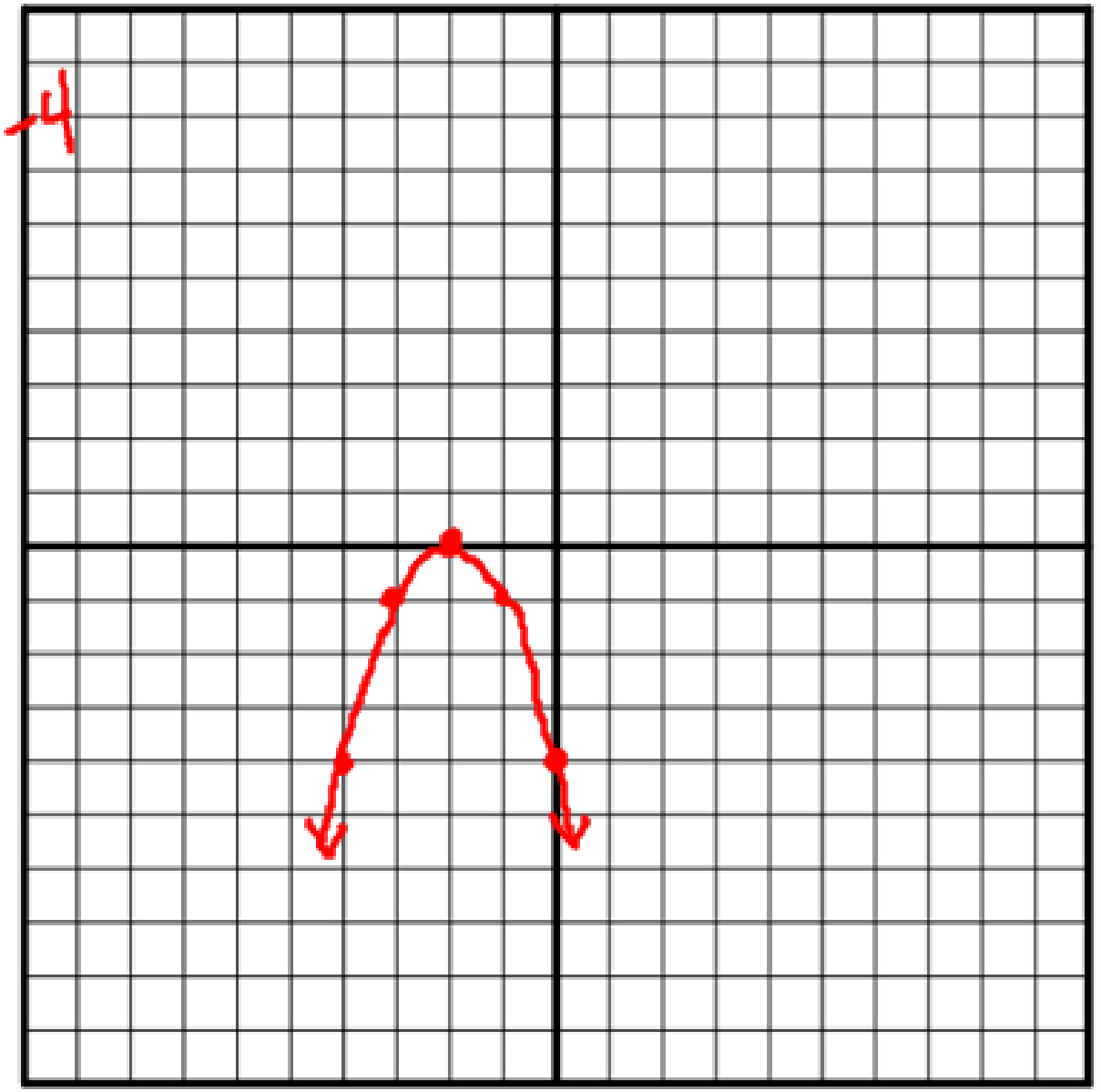
b) $y = -x^2 - 4x - 4$

x	y
-4	-4
-3	-1
-2	0
-1	-1
0	-4

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

$y = -1 + 4 - 4$

$y = -1$



zeros: $(-2, 0)$

Domain: all real #s

Range: $y \leq 0$

c) $y = 2x^2 - 3x + 5$

a = 2 b = −3 c = 5

axis of symmetry

$x = \frac{3}{2(2)} = 3/4$ $x = 3/4$

vertex

$y = 2(3/4)^2 - 3(3/4) + 5$ $(3/4, 3.875)$

$y = 3.875$

y-int 5

max or min

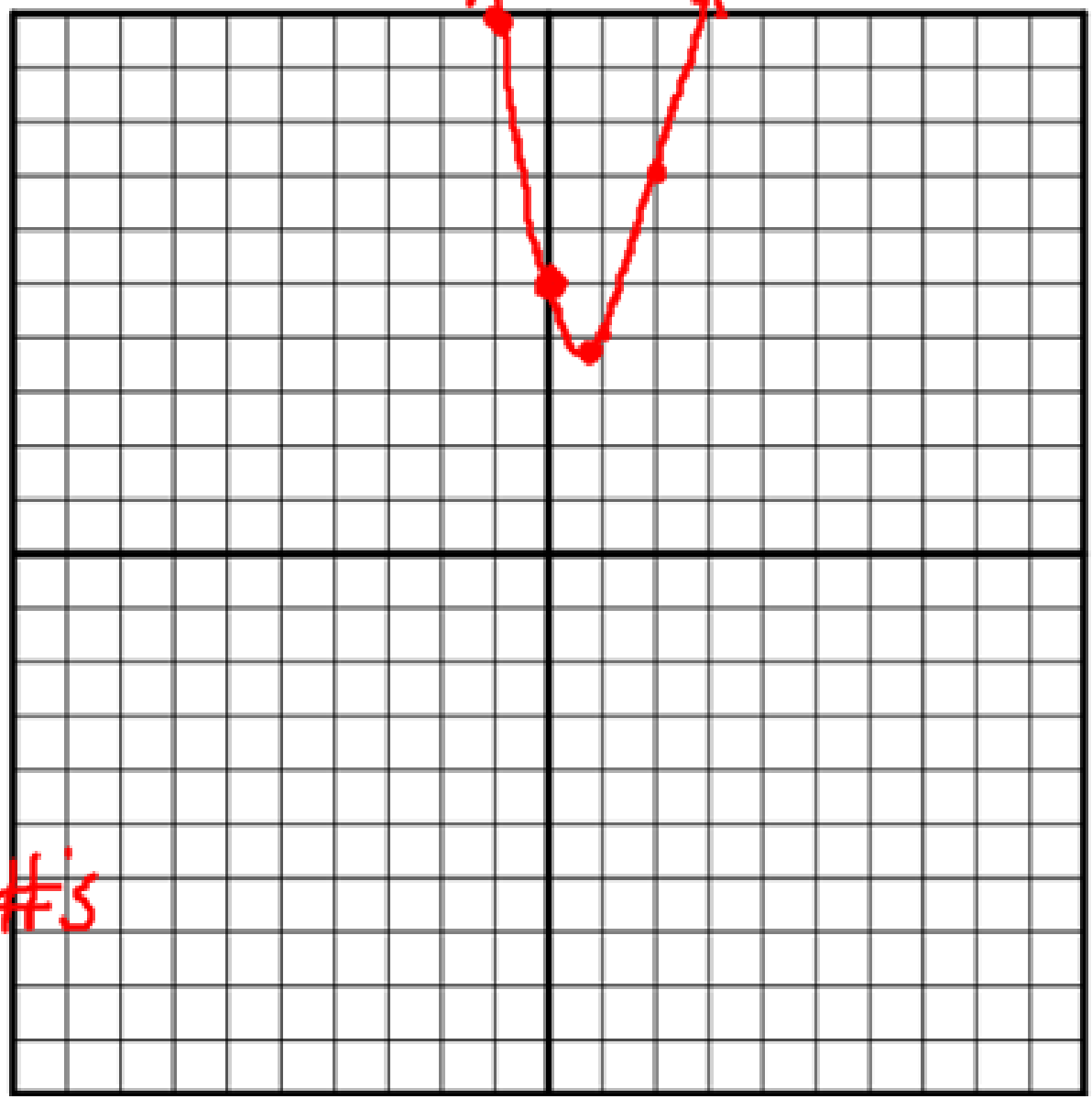
c) $y = 2x^2 - 3x + 5$

x	y
-1	10
0	5
.75	3.875
1	4
2	7

$f(-1) = 2+3+5 = 10$

$f(1) = 2 - 3 + 5 = 4$

$f(2) = 8 - 6 + 5 = 7$



Zeros: none

Domain: all real #'s

Range: $y \geq 3.875$

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

a = -1 b = 3 c = 0

axis of symmetry

$x = -\frac{3}{2(-1)}$ $x = 3/2$ $= 1.5$

vertex

$(1.5, 2.25)$ $y = -(3/2)^2 + 3(3/2)$

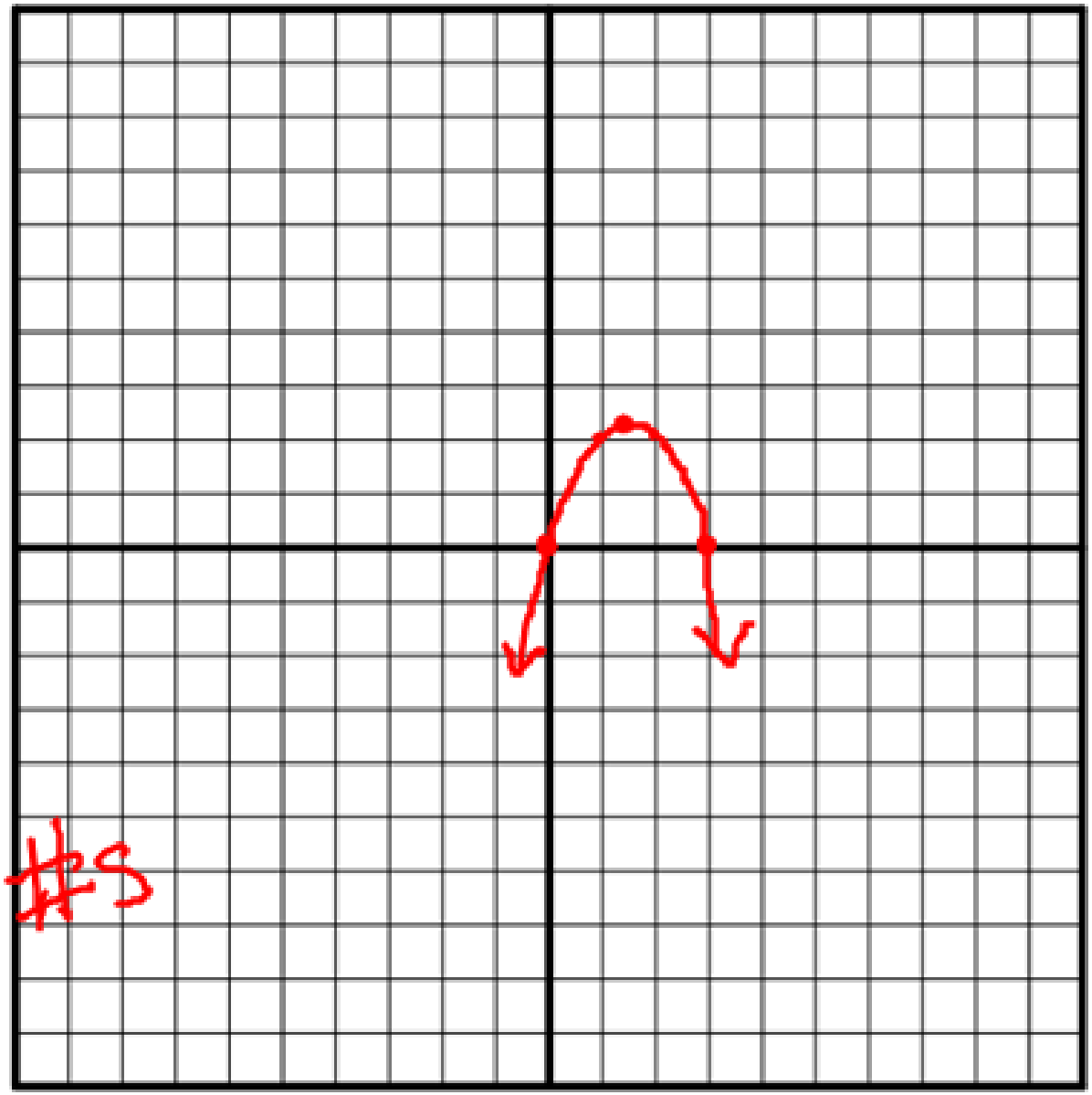
y-int 0

max or min

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

$f(1) = -1 + 3 = 2$

x	y
0	0
1	2
1.5	2.25
2	2
3	0



Zeros {0, 3}

Domain: all real #s

Range: $y \leq 2.25$

Goals Aligned to the SPIs & Common Core Standards

You can graph a quadratic function.

You can identify the key features of a quadratic function.

Classwork...

Complete Worksheet

Warm Up

The first three figures in a pattern are shown.

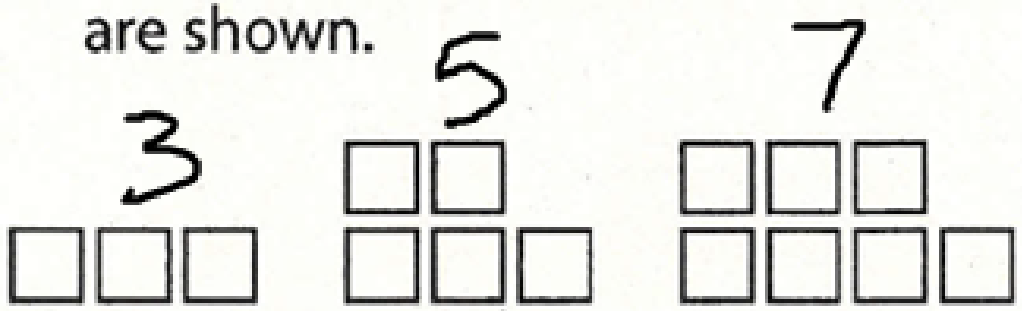


Figure 1 **Figure 2** **Figure 3**

□ = 1 small square

Which function represents $f(n)$, the number of small squares in figure n?

a_1 a_2 a_3
3 5 7

$2(1) - 1 = 1$

A ~~$f(n) = 2n - 1$~~

B $f(n) = 2n + 1$

C ~~$f(n) = 3n + 1$~~

D ~~$f(n) = n^2 + 1$~~

$a_n = 3 + (n-1)2$

$3 + 2n - 2$

1