Properties of Graphs of Quadratic Relations

Learning Goal

- Describe the key features of the graph of quadratic relations, and us the graphs to solve problems.
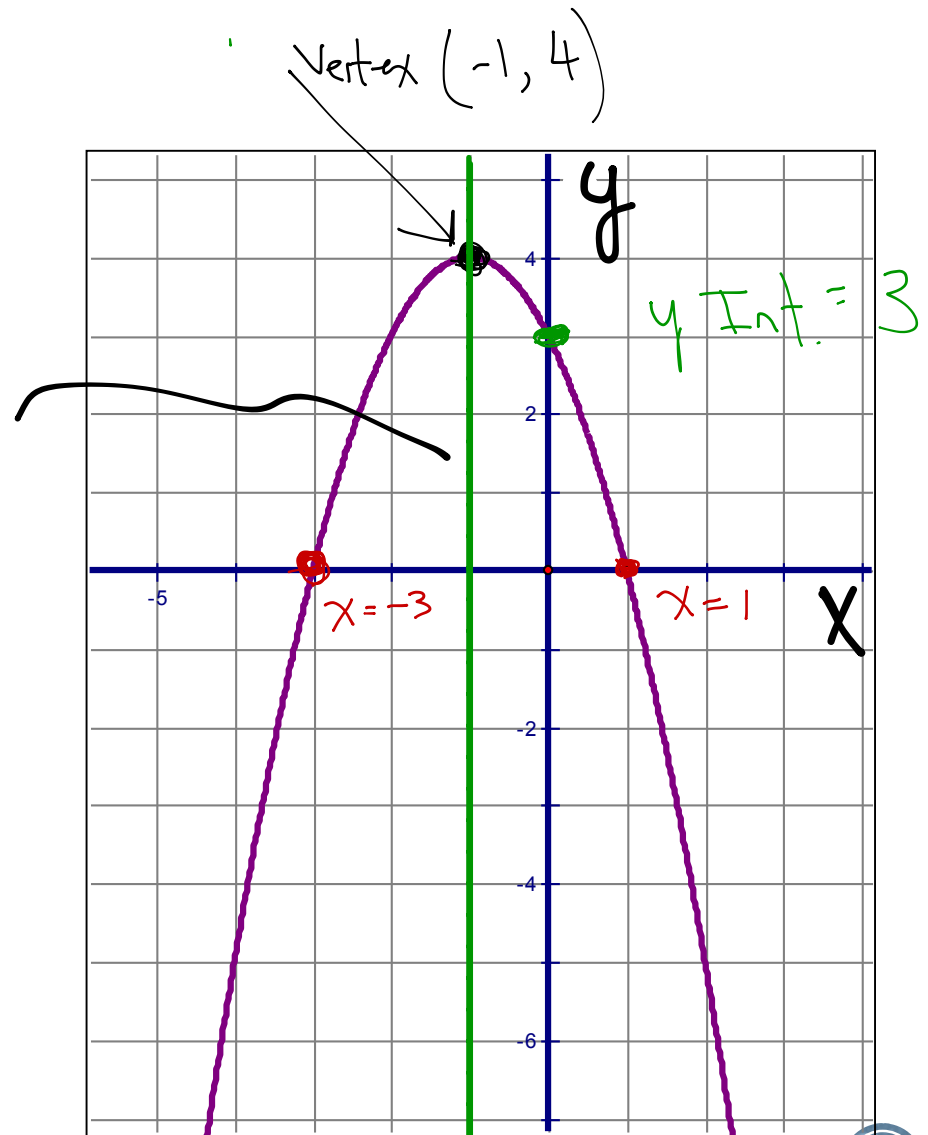
Big Ideas

- The key features of a parabola:
  - Y-intercept
  - Zeros (x-intercepts)
  - Vertex
  - Equation of Axis of Symmetry
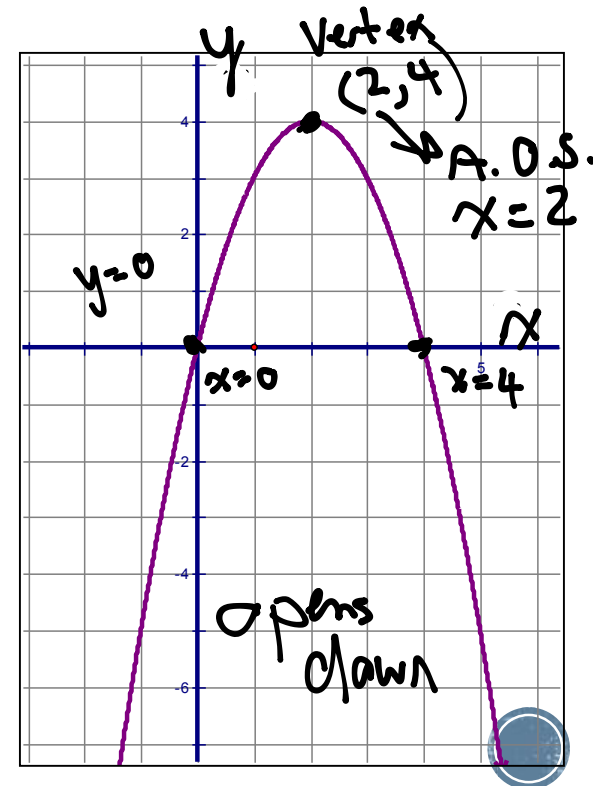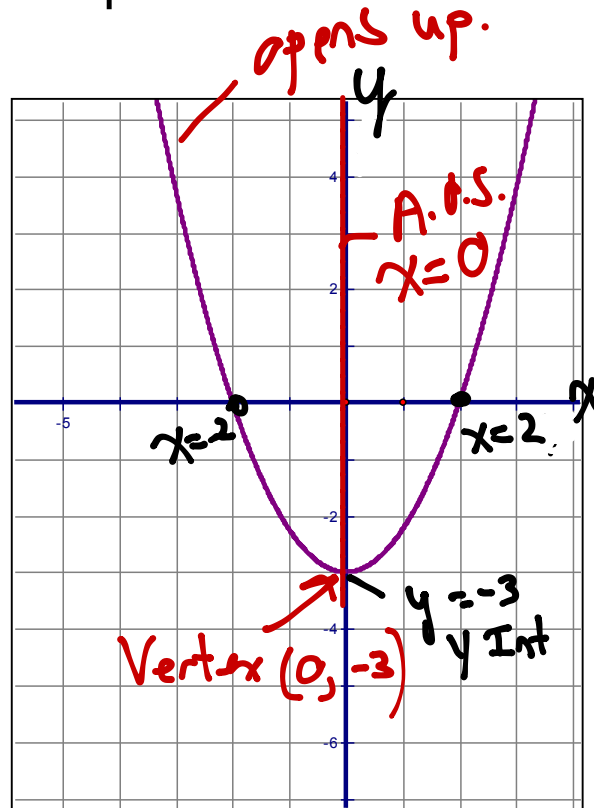 - Direction of Opening

$x = -1$

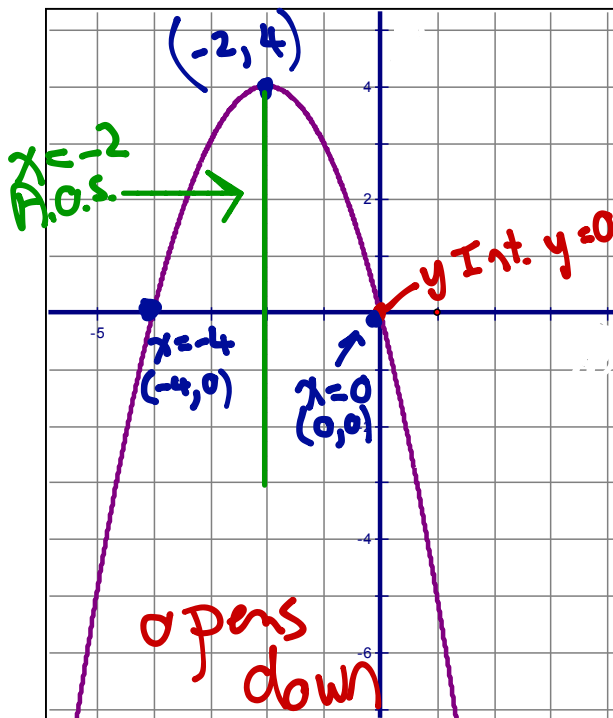A.O.S.

Open at bottom

$\therefore$ opens down.

Vertex $(-1, 4)$

y

Y Int. = 3

$x = -3$

$x = 1$

x

Example #1

- For each graph, state the y-intercept, the zeros, the coordinates of the vertex, and the equation of the axis of symmetry.

Example #2

$-x^2$

$(-x)^2$

- Create a table of values for the quadratic relation $y = -x^2 + 6x - 5$, sketch its graph, and determine its features.

$$y = -x^2 + 6x - 5$$

x	y
0	-5
1	0
2	3
3	4
4	3
5	0
6	-5

$x = 3$

$$y = -x^2 + 6x - 5$$
$$= -(3)^2 + 6(3) - 5$$
$$= -(9) + 18 - 5$$
$$= -9 + 18 - 5$$
$$y = 4$$

$\therefore (3, 4)$

Vertex (3, 4)

A.O.S. $x = 3$

$x = 1$ $x = 5$

y Int. $y = -5$

opens down.
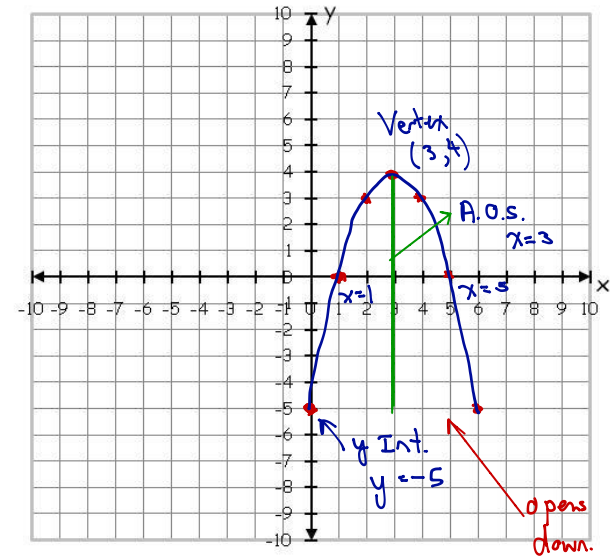
Example #3

- A football is kicked into the air. Its height above the ground is approximated by the relation $h = 20t - 5t^2$, where h is the height in metres and t is the time in seconds since the football was kicked.
  - What are the zeros of the relation? When does the football hit the ground?
  - What are the coordinates of the vertex? What does the vertex mean?

Solution

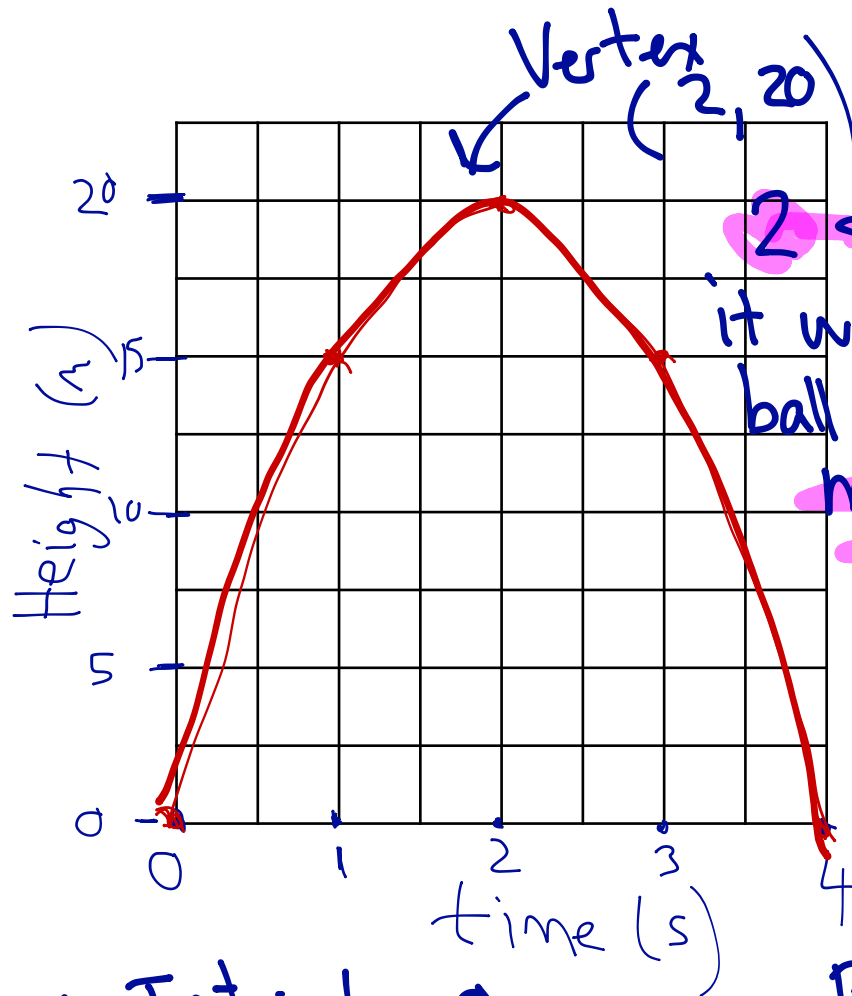| t (seconds)	h (metres)
0	0
1	15
2	20
3	15
4	0

$h = 20t - 5t^2$

$h = 20(2) - 5(2)^2$

$= 40 - 5(4)$

$= 40 - 20$

$h = 20$

$\therefore (2, 20)$

Vertex (2, 20)

2 seconds after it was kicked the ball reached a maximum height of 20m
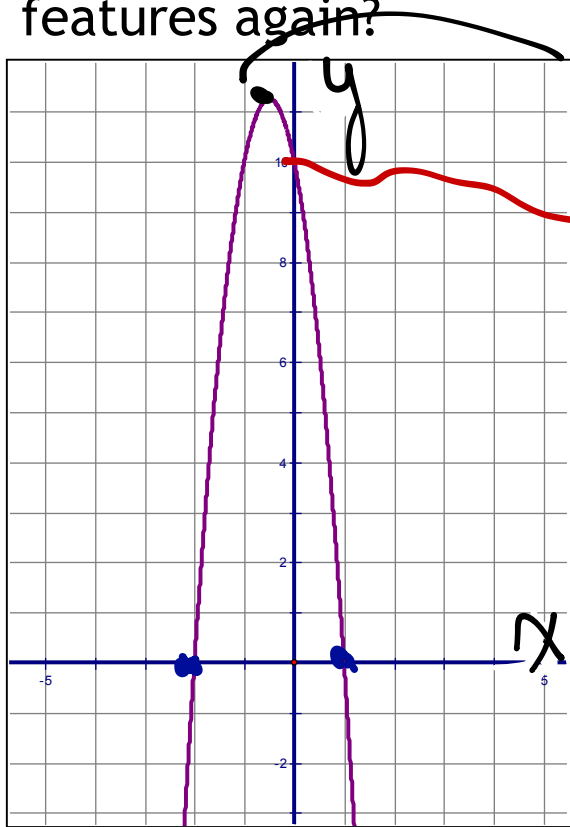
Height (h)

time (s)

y Int.: $h = 0$

x Int.: $t = 0$

$t = 4$

Ball is on ground at $t = 0s$ and $t = 4s$

Consolidation

- How much do you remember? Can you name those 5 important features again?

Vertex

y Int.
y = 10

A.O.S.
x = -0.5

x Int.
x = 1
x = -2

Direction of
Opening
- opens down.

Reinforcement

- Pages 146 – 148
  - #4 – 6, 7ef, 9 – 11, 13, 14

Quiz Thursday
3.1, 3.2