Class #22 - Thurs, Oct. 21

- Midterm grades - next week.
  - Exam #1 + WebWork + Quizzes
  - optional midterm conferences

- Quiz #3 - next week
  (quadratic formula + complex #s)

solutions of $ax^2+bx+c=0$ are

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

quadratic equation $ax^2+bx+c=0$ has 2 complex solutions if the discriminant is negative, i.e., if $b^2-4ac<0$

Last time: We found the solutions of the quadratic equation

$x^2 - 6x - 3 = 0$

(quadratic polynomial / quadratic "function")

x-values where $y = 0$

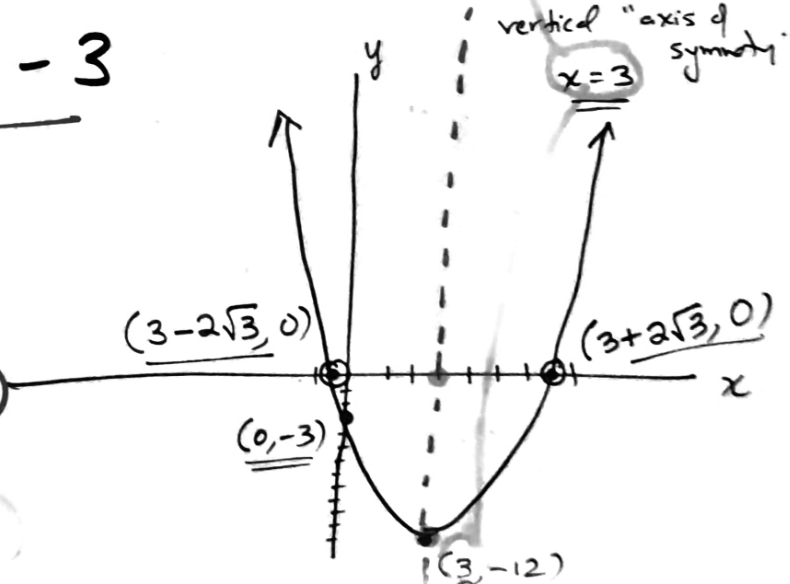
using the quadratic formula: $x = 3 \pm 2\sqrt{3}$

In Desmos, we can look at the **graph** of

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

★ find the y-int by plugging in $x = 0$ (into $x^2 - 6x - 3$)

$y = 0^2 - 6(0) - 3 = -3$ → $(0, -3)$



Summary: (y-intercept & x-intercept(s) of "parabola")

(1) y-intercept of $y = ax^2 + bx + c$

is the y-value when $x = 0$,

plug in $x=0$

i.e., $y = a\cdot(0^2) + b(0) + c = c$

$\Rightarrow$ y-int is at $(0, c)$

(2) x-intercept(s) of $y = ax^2 + bx + c$

are the x-values where $y = 0$,

Solve for when $y=0$

i.e., x-intercepts are the solutions to the quadratic equation

$$ax^2 + bx + c = 0$$

Sketch the graph of $y = x^2 - 6x - 3$ ← y-int

From quadratic formula,

solutions of $x^2 - 6x - 3 = 0$

are $x = 3 \pm 2\sqrt{3}$

x-intercepts

$x = 3 + 2\sqrt{3} \approx 6.464$

$x = 3 - 2\sqrt{3} \approx -0.464$

x-coord of the vertex!

"axis of symmetry"

$x = 3$

y-coord of vertex?

plug in $x = 3$!!

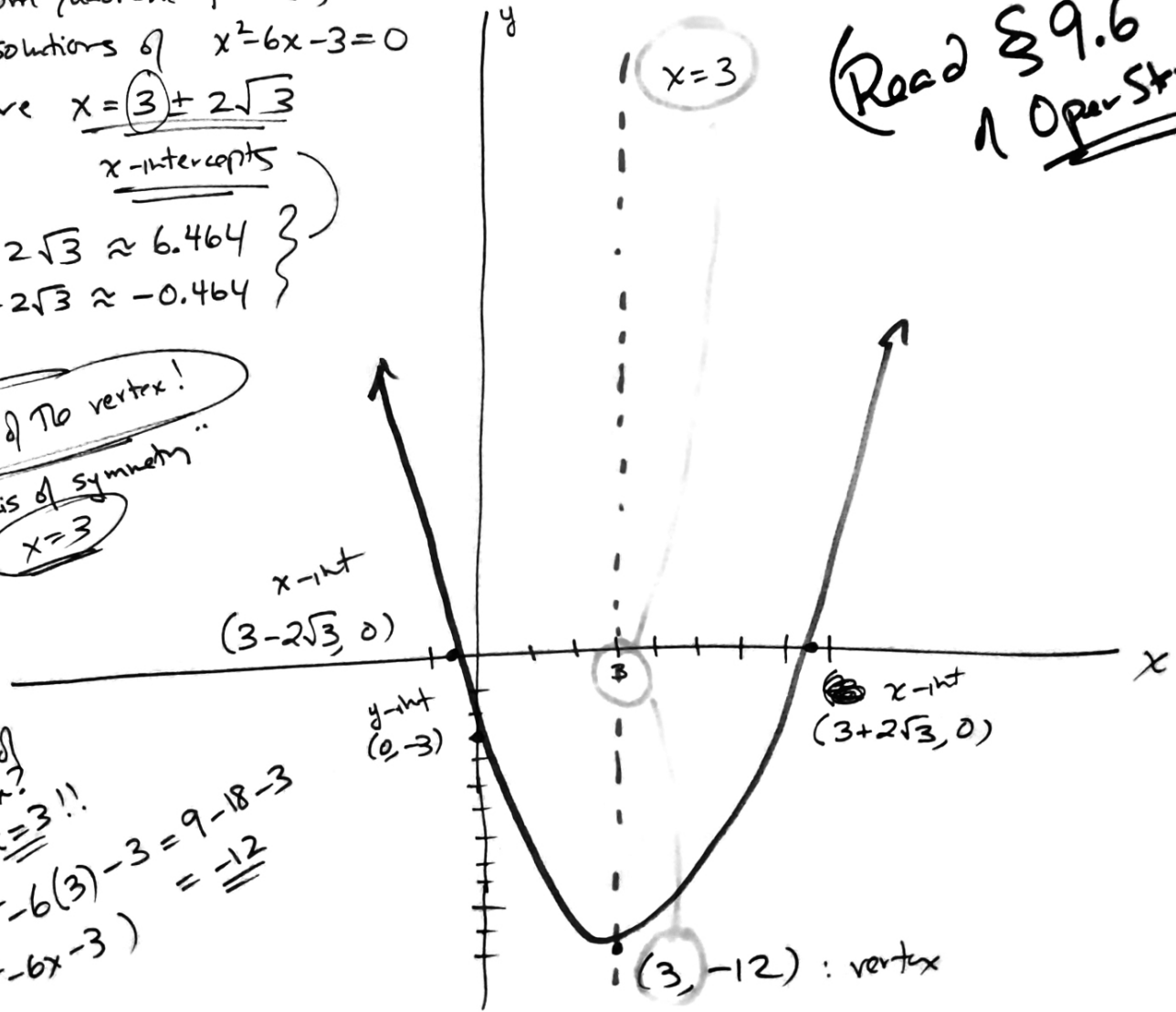
$y = (3)^2 - 6(3) - 3 = 9 - 18 - 3$

$= -12$

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

(Read §9.6

1 Open Stax)



Class #23 – Fri, Oct. 22

reviewing the example from yesterday

$$y = 1x^2 - 6x - 3$$

- vertex?
- and "axis of symmetry"

how do we find the (x, y) coordinates of the vertex algebraically?

→ given by $\boxed{x = -\frac{b}{2a}}$ } for any given quadratic function $y = ax^2 + bx + c$

For our example from yesterday:

$$x = -\frac{(-6)}{2(1)} = \frac{6}{2} = 3 \implies \boxed{x = 3}$$

The vertex of the parabola is where the "axis of symmetry" ($x = -\frac{b}{2a}$) intersects the parabola.

Therefore, the x-coord of the vertex is also given by $x = -\frac{b}{2a}$

(So for the example $y = x^2 - 6x - 3$, the x-coord of the vertex is $x = -\frac{(-6)}{2} = 3$).

How do we get the y-coord of the vertex?
→ Plug in x-coord into the given quadratic!

Plug in $x = 3$:

$$y = (3)^2 - 6(3) - 3 = 9 - 18 - 3 = -12$$

vertex $(3, -12)$

Axis of symmetry / vertex (for $y = ax^2 + bx + c$)

x-coord.

Given by $x = -\frac{b}{2a}$.

where does "$-\frac{b}{2a}$" appear in the QF?

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$