Unit 4: Graphing 2nd degree function of the form $y = ax^2 + c$

$y = ax^2 + bx + c$

The role of parameter 'c'

- 'c' is our vertical translation

  ex. if $c = 2$, it moves the graph 2 units upwards

  $c = -2$, 2 units downwards.

- c tells us our y-int, that is, the y-int of a parabola is always $(0, c)$

$y = ax^2 + bx + c$

y-int

$y = x^2 + 2$ $(0, 2)$

$y = 2x^2 + 2$ $(0, 2)$

$y = \frac{1}{2}x^2 + 2x + 2$ $(0, 2)$

$y = x^2 - 2$ $(0, -2)$

$y = 2x^2$ $(0, 0)$

$y = 2x^2 + 2x$ $(0, 0)$

graph $y = -4x^2 - 2$

Step ① Find vertex

$V\left(\frac{-b}{2a}, -\frac{\Delta}{4a}\right)$

$a = -4$

$b = 0$

$c = -2$

$\Delta = b^2 - 4ac$

sub in values!

$\Delta = (0)^2 - 4(-4)(-2)$

$\Delta = 16(-2)$

$\Delta = -32$

$V\left(\frac{-0}{2(-4)}, \frac{-(-32)}{4(-4)}\right)$

$V\left(0, \frac{32}{-16}\right)$

$V(0, -2)$

Step ② construct a table of values w/ vertex in the middle. Pick x values surrounding the vertex. Sub in the different values of x to find y

$y = -4x^2 - 2$

x	y	
-2	$-4x^2-2 = -4(-2)^2 - 2 = -18$	marvin
-1	$-4(-1)^2 - 2 = -6$	abisha
V → 0	-2	
1	$-4(1)^2 - 2 = -6$	hannah
2	$-4(2)^2 - 2 = -18$	helen

Step ③: Plot points!

5 characteristics

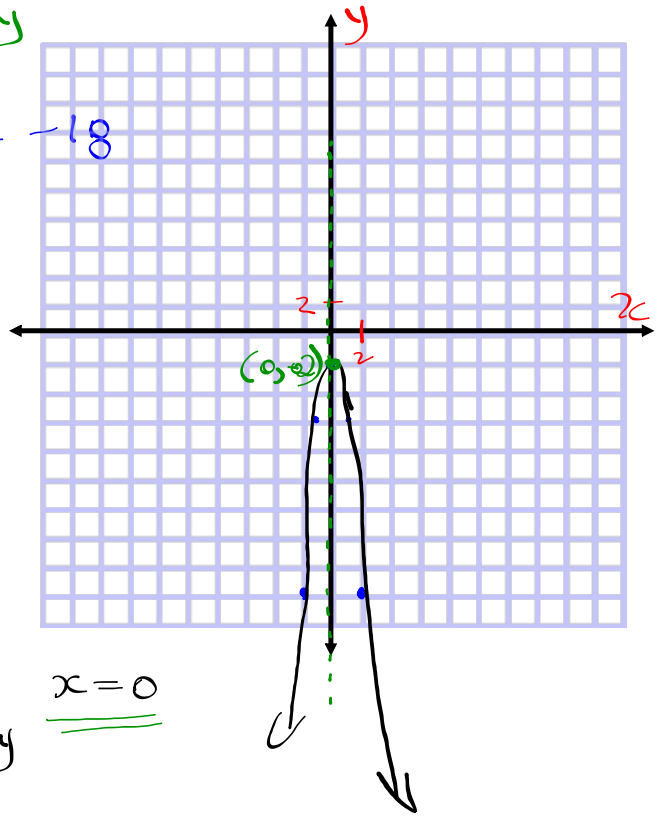
① vertex (0, -2)

② y-int (0, -2)

③ x-int(s) none

④ point symmetric (-2, -18) (2, -18)

⑤ axis of symmetry $x = 0$



graph and give the five characteristics

$y = ax^2 + c$

$y = 3x^2 - 5$

(4th) Find the point symmetric w (-1, 8)

graph:

$y = 3x^2 - 5$

Vertex $(0, -5)$

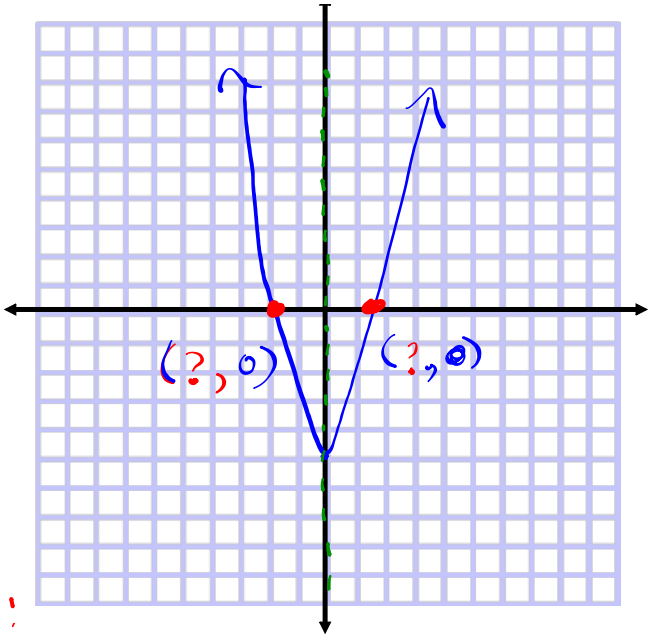
y-int $(0, -5)$

axis of sym $x = 0$

To find x-ints!

Use the parabolas formula to find our unknown.

and sub in $y = 0$ since y is always zero at the x-int(s)



$y = 3x^2 - 5$

sub in $y = 0$

$0 \overset{+5}{=} 3x^2 - 5 \overset{+5}{}$

$\frac{5}{3} = \frac{3x^2}{3}$

$\sqrt{\frac{5}{3}} = \sqrt{x^2}$

$\pm 1.29 = x$

Recall!

Solve for x by performing the opposite operation to both sides

$x^2 = 4$

$(-2)^2$

$\sqrt{x^2} = \sqrt{4}$

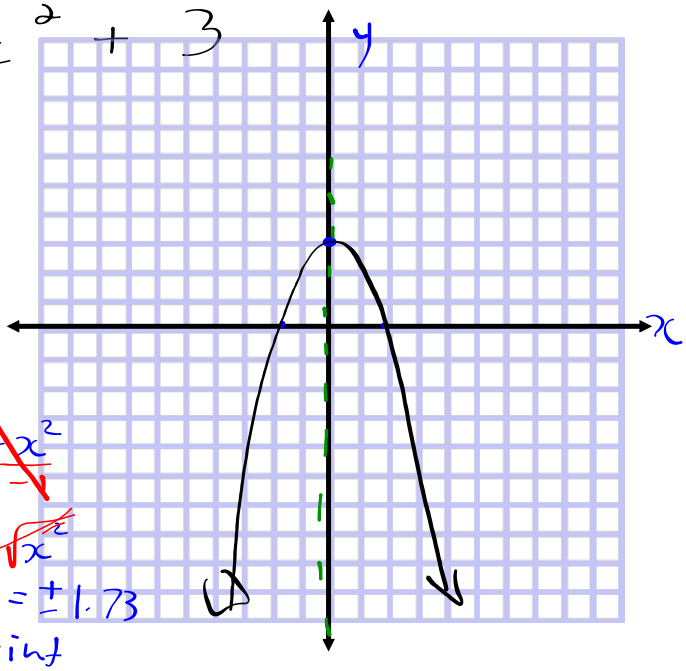
$x = \pm 2$

Nota Bene:

When you square root a number, the answer is always twofold. It's $\pm$

ch2

graph $y = -x^2 + 3$



① vertex $(0, 3)$

② y-int $(0, 3)$

③ x-ints $y = 0$

$0 = -x^2 + 3$

$-3 = -x^2$

$\sqrt{3} = \sqrt{x^2}$

$x = \pm 1.73$

x-int

$(1.73, 0)$ $(-1.73, 0)$

④ point symmetric with $(1, 2)$

⑤ axis of symmetry

Intro Strategies to Word Questions

- Understand Question!
- Sketch
- Translate the question sentence into a point to find!
  ex. vertex?
  y-int?
  x-int?

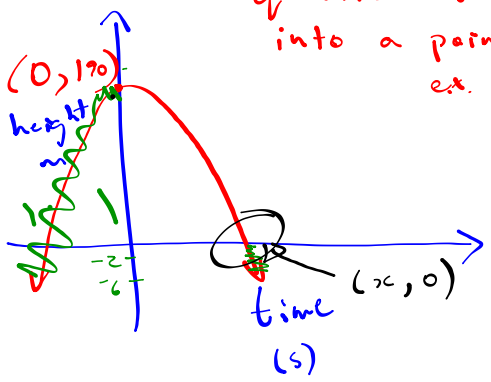
P. 4.1

$h = -16t^2 + 190$

$y = -16x^2 + 190$

y-int $(0, 190)$ ∪

Q: How long does it take for the ball to reach the ground?



Sub in $y = 0$

solve for x

$0 = -16x^2 + 190$ (−190)

$-190 = -16x^2$

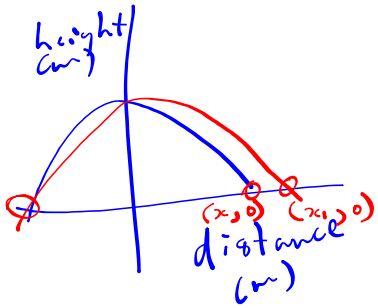
$\frac{-190}{-16} = \frac{-16x^2}{-16}$

$\frac{190}{16} = x^2$

$x = \pm 3.45$

∴ it takes the ball 3.45 secs to reach the ground

Shannon and Simon are on the Olympic Stadium 190 m above ground. Simon proposed to Shannon and she throws the ring to the ground. Simon gets really mad and he throws Shannon's cell phone to ground. Who threw what the furthest if the below formula represent the height of the objects over the distance.



ring : $h = -6d^2 + 190$

cell : $h = -20d^2 + 190$

ring ~~###~~

cell (circled)

sub in $y = 0$

$0 = -6d^2 + 190$ (−190)

$-190 = -6d^2$

$\frac{-190}{-6} = \frac{-6d^2}{-6}$

$\sqrt{\left(\frac{190}{6}\right)} = \sqrt{d^2}$

$d = \pm 5.63$ m