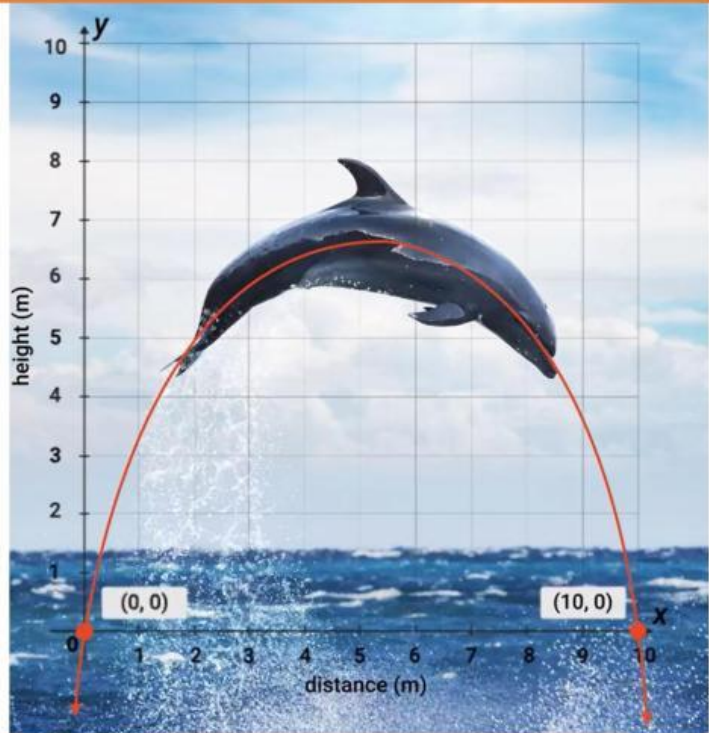


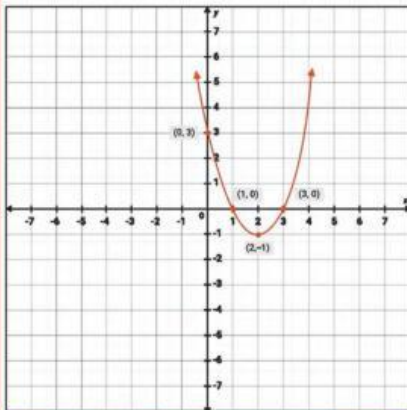
Learn

Mark the point where the dolphin jumps out of the water. (.....,)

estimate the point where the dolphin jumps back to the water. (.....,)

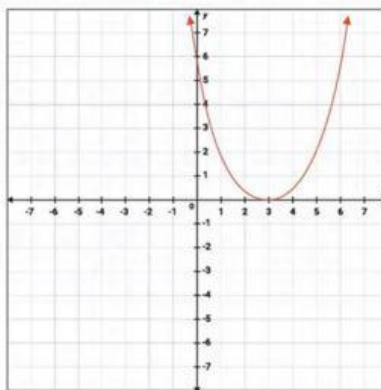


There can be **3 types** of solutions or roots:



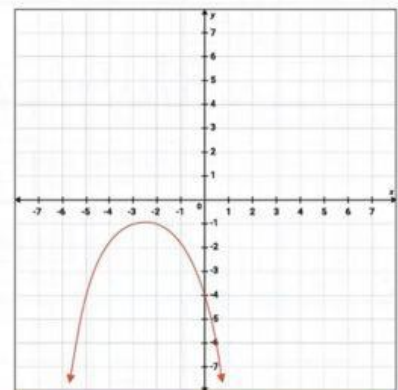
two unique real solutions

Solutions: $x = \dots\dots\dots$ and
 $x = \dots\dots\dots$



one unique real solution

Solution: $x = \dots\dots\dots$

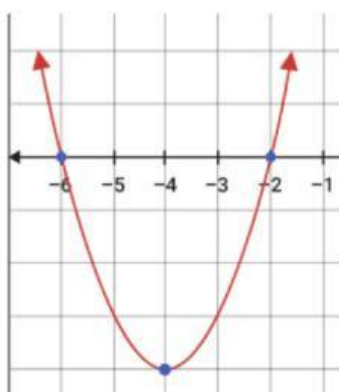


no real solutions

Solution: $x = \dots\dots\dots$
Because

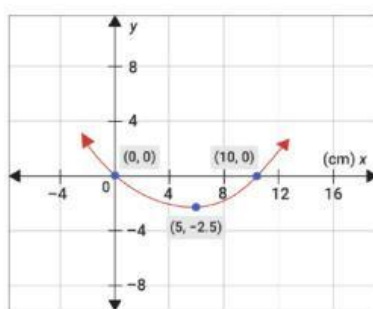
Hint: solutions are the x-intercepts

Find the solutions



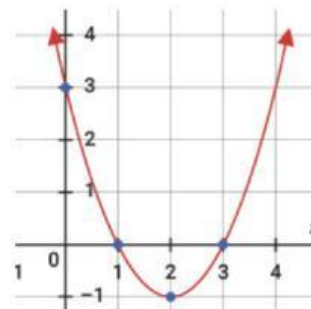
Solutions: $x = \dots\dots\dots$ and

$x = \dots\dots\dots$



Solutions: $x = \dots\dots\dots$ and

$x = \dots\dots\dots$

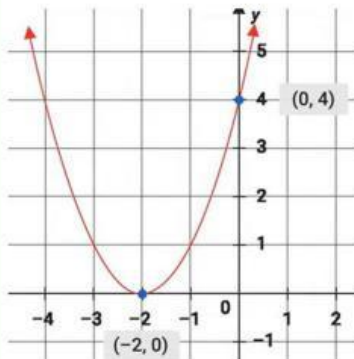


Solutions: $x = \dots\dots\dots$ and

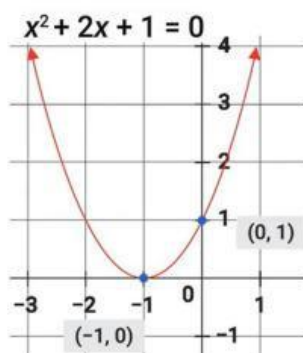
$x = \dots\dots\dots$

Hint: solutions are the x-intercepts

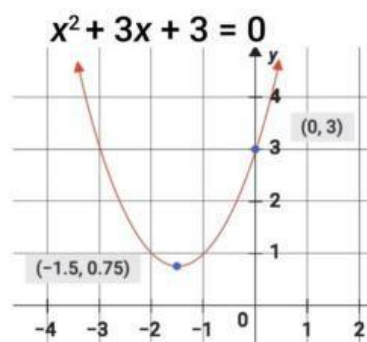
Find the solutions



Solutions: $x = \dots\dots\dots$



Solutions: $x = \dots\dots\dots$

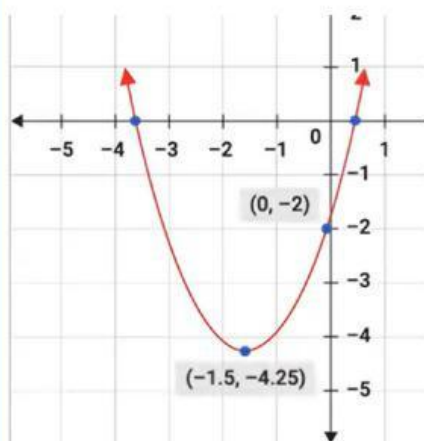


Solutions: $x = \dots\dots\dots$

Because $\dots\dots\dots$

Hint: solutions are the x-intercepts

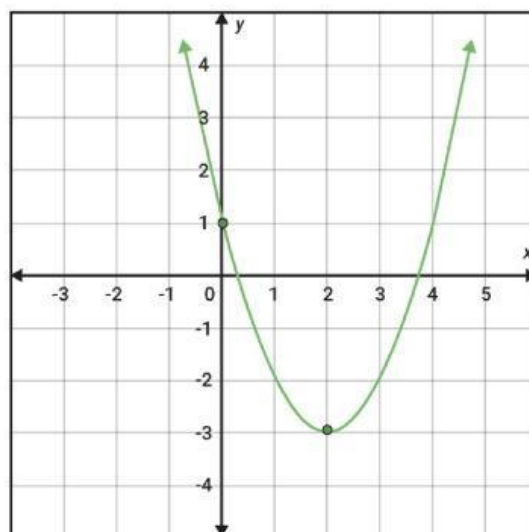
Estimate the solutions of the quadratic equations shown in the graphs



The first solution lies between And

The second solution lies between And

Hint: solutions are the x-intercepts



The first solution lies between And

The second solution lies between And

Estimate the solutions of the quadratic equations shown in the table

For the quadratic function $y = -x^2 + 2x + 4$, a table is used to approximate the zeros of the function. From the tables, identify the approximate zeros of the given function.

x	-1.5	-1.4	-1.3	-1.2	-1.1	-1	-0.9
y	-1.25	-0.76	-0.29	0.16	0.59	1	1.39

x	3.1	3.2	3.3	3.4	3.5	3.6	3.7
y	0.59	0.16	-0.29	-0.76	-1.25	-1.76	-2.29

The first solution is approximately

The second solution is approximately

Hint: the solutions are the x values for which the y values are closest to zero

Solved example:

Solve: $x^2 + 5x = -4$

solution:

Step 1) make the equation = 0 by moving the constant to the other side:

$$\begin{aligned}x^2 + 5x &= -4 \\x^2 + 5x + 4 &= 0\end{aligned}$$

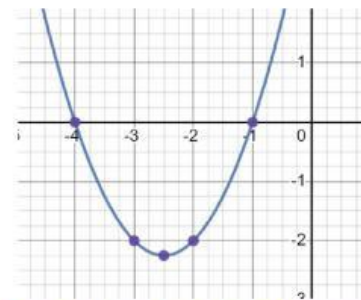
Step 2) graph by making a table of x and y values

A) Axis of symmetry = $-\frac{b}{2a} = -\frac{5}{2(1)} = -2.5$

B) Make a table where -2.5 is in the middle

x	y = $x^2 + 5x + 4$	(x, y)
-4	$y = (-4)^2 + 5(-4) + 4 = 0$	(-4, 0)
-3	$y = (-3)^2 + 5(-3) + 4 = -2$	(-3, -2)
-2.5	$y = (-2.5)^2 + 5(-2.5) + 4 = -2.25$	(-2.5, -2.25)
-2	$y = (-2)^2 + 5(-2) + 4 = -2$	(-2, -2)
-1	$y = (-1)^2 + 5(-1) + 4 = 0$	(-1, 0)

Step 3) plot the points



Step 4) find the x-intercepts:

Solutions: $x = \dots\dots\dots$ and $x = \dots\dots\dots$

Example:

Solve $10 - x^2 = 4x + 14$ by graphing.

solution:

Step 1) make the equation = 0 by moving the constant to the other side:

$$\begin{aligned}10 - x^2 &= 4x + 14 \\-10 + x^2 &= 4x + 4 \\0 &= x^2 + \dots\dots\dots x + \dots\dots\dots\end{aligned}$$

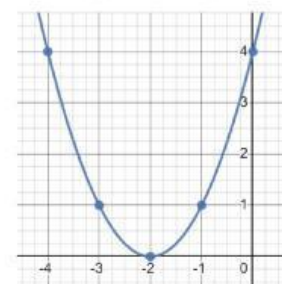
Step 2) graph by making a table of x and y values

A) Axis of symmetry = $-\frac{b}{2a} = -\frac{4}{2(1)} = -2$

B) Make a table where -2 is in the middle

x	y = $x^2 + 4x + 4$	(x, y)
-4	$y = (-4)^2 + 4(-4) + 4 = \dots\dots\dots$	(-4, \dots\dots\dots)
-3	$y = (-3)^2 + 4(-3) + 4 = \dots\dots\dots$	(-3, \dots\dots\dots)
-2	$y = (-2)^2 + 4(-2) + 4 = \dots\dots\dots$	(-2, \dots\dots\dots)
-1	$y = (-1)^2 + 4(-1) + 4 = \dots\dots\dots$	(-1, \dots\dots\dots)
0	$y = (0)^2 + 4(0) + 4 = \dots\dots\dots$	(0, \dots\dots\dots)

Step 3) plot the points



Step 4) find the x-intercepts:

Solution: $x = \dots\dots\dots$