Graphing quadratic functions

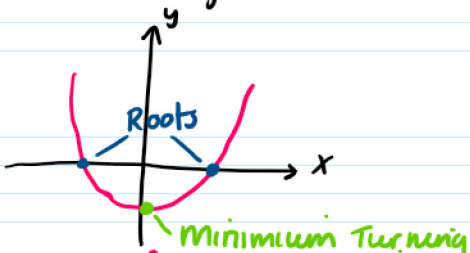
04 December 2019 09:44

A quadratic function will always be in the form ax^2+bx+c where the highest power of x is 2.

Quadratic will be a curve called a parabola

Quadratics can be in two shapes

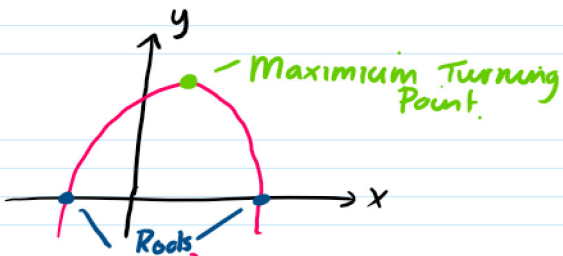
When the coefficient of x^2 is greater than 0



$ax^2 > 0$

a is positive

When the coefficient of x^2 is less than 0



$-ax^2 < 0$

$-a$ is negative

Roots are where the curve cuts the x axis
On the x axis $y=0$. $f(x)=0$
y

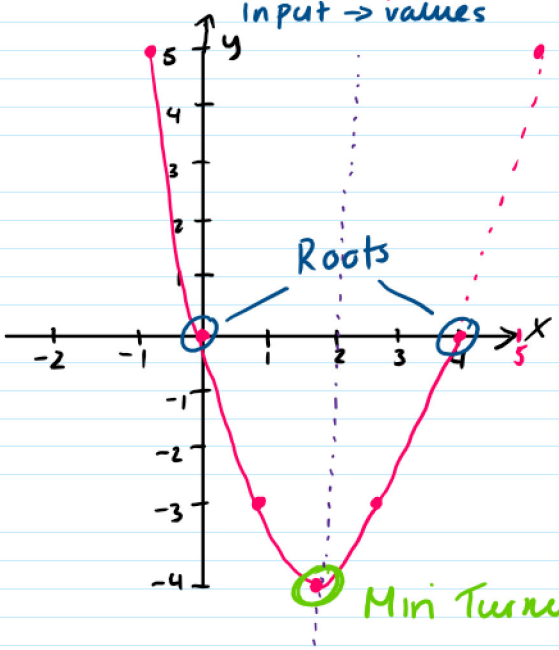
Eg1) Draw a graph of the function

$f: x \to x^2-4x$ in the domain $-1 \leq x \leq 4$ $\{-1, 0, 1, 2, 3, 4\}$

Input → values

Table

x	y f(x)	Couples (x, y)
-1	5	(-1, 5)
0	0	(0, 0)
1	-3	(1, -3)
2	-4	(2, -4)
3	-3	(3, -3)
4	0	(4, 0)



Roots $f(x)=0$

$x=0$ $x=4$

$x^2-4x=0$

$x(x-4)=0$

$x=0$ $x-4=0$

$x=4$

Axis of symmetry

$x=2$

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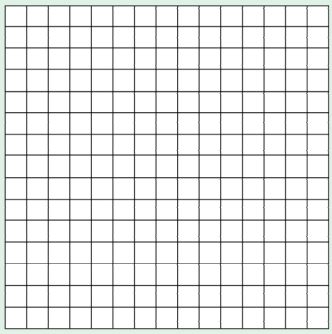
Chapter 17

Graphing Functions

Section 17.2 Graphs of quadratic functions

Example 1

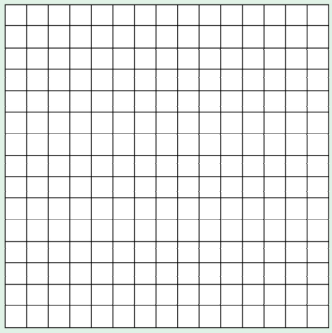
Draw the graph of the function $f(x) = x^2 - 2x - 3$ in the domain $-2 \leqslant x \leqslant 4$.



476

Example 2

Draw the graph of the function $f(x) = -x^2 + 3x + 4$ in the domain $-2 \leqslant x \leqslant 5$ by setting out a table of values.
Use your table to show that the second differences between the outputs are constant and write down the value of this constant.

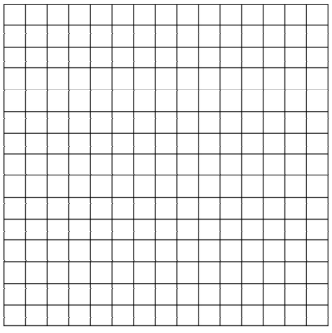


477

Exercise 17.2

1. Complete the table on the right and hence draw a graph of the function $f(x) = x^2 - 4$ in the domain $-3 < x < 3$.

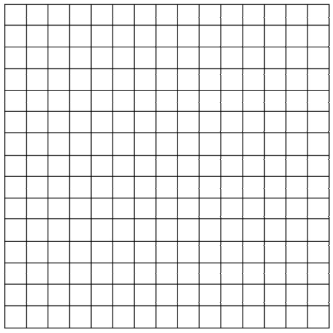
x	$x^2 - 4$	y
−3		
−2		
−1		
0		
1		
2		
3		



478

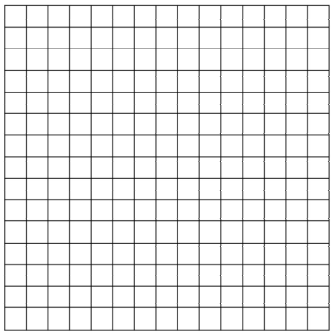
Exercise 17.2

2. Draw the graph of the function $f: x \to x^2 - 4x$ in the domain $-1 \leqslant x \leqslant 4$.



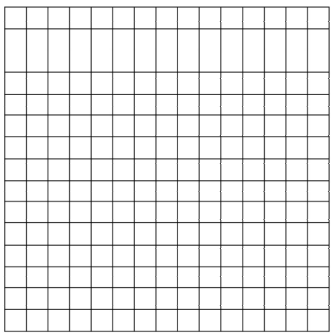
Exercise 17.2

3. Draw the graph of the function $f(x) = x^2 + x - 2$ in the domain $-3 \leqslant x \leqslant 3$.



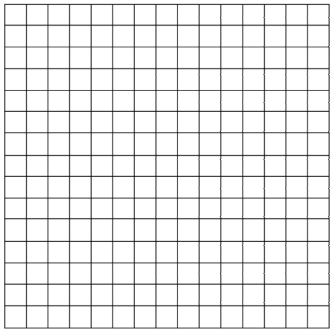
Exercise 17.2

4. Draw the graph of the function $f(x) = 2x^2 - x - 3$ in the domain $-2 \leqslant x \leqslant 3$.



Exercise 17.2

5. Draw the graph of the function $f(x) = 2x^2 + 3x - 4$ in the domain $-3 \leqslant x \leqslant 2$.



Exercise 17.2

6. $f(x) = 2x^2 - 5x - 3$ defines a function.

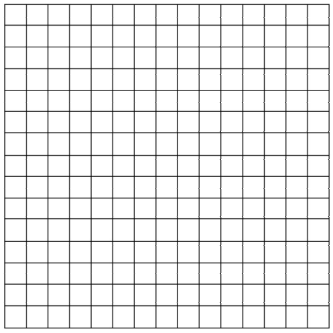
Draw up a table of input and output values for $x = -2$ to $x = 4$.
Write down the first differences and second differences between the output values.
Write down the value of the second difference.
What is the connection between this second difference and the coefficient of x^2 in the given function?

Exercise 17.2

7. If $f(x) - 4x^2 - 3x + 5$ defines a function, what is the second difference between the outputs?

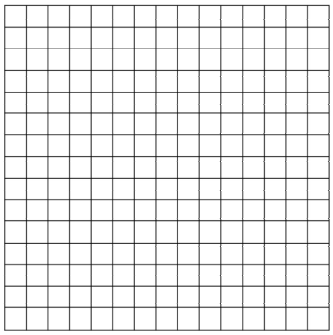
Exercise 17.2

8. Draw the graph of the function $y = -x^2$ in the domain $-2 \leqslant x \leqslant 2$.



Exercise 17.2

9. Draw the graph of the function $f: x \rightarrow -x^2 + 2x + 3$ in the domain $-2 \leqslant x \leqslant 4$.
Use your graph to find the coordinates of the points where the graph crosses the x-axis.



Answers 17.2

1. $(-3, 5), (-2, 0), (-1, -3), (0, -4), (2, 0), (3, 5)$
2. $(-1, 5), (0, 0), (1, -3), (2, -4), (3, -3), (4, 0)$
3. $(-3, 4), (-2, 0), (-1, -2), (0, -2), (1, 0), (2, 4), (3, 10)$
4. $(-2, 7), (-1, 0), (0, -3), (1, -2), (2, 3), (3, 12)$
5. $(-3, 5), (-2, -2), (-1, -5), (0, -4), (1, 1), (2, 10)$
6. $(-2, 15), (-1, 4), (0, -3), (1, -6), (2, -5), (3, 0), (4, 9)$;
1st differences: $-11, -7, -3, 1, 5, 9$
2nd difference: 4, 4, 4, 4, 4
The 2nd difference is twice the coefficient of x^2
7. 8
8. $(-2, -4), (-1, -1), (0, 0), (1, -1), (2, -4)$
9. $(-2, -5), (-1, 0), (0, 3), (1, 4), (2, 3), (3, 0), (4, -5), (-1, 0), (3, 0)$