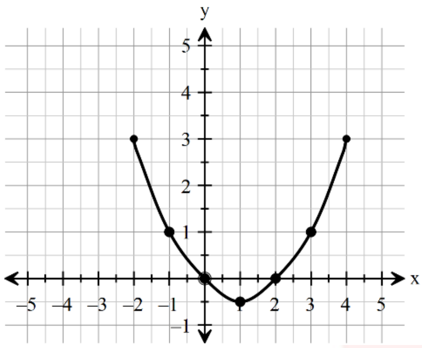
Solving one equation of the 2^{nd} degree of one variable

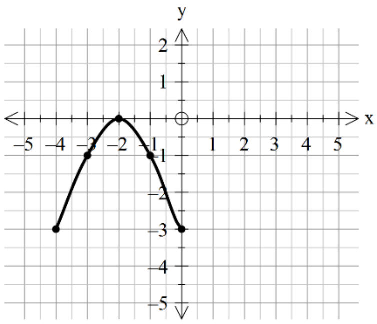
Graphically | General formula

1st Graphically

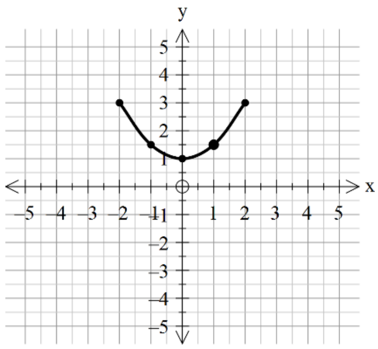
cuts the X-axis at 2 points



cuts the X-axis at one point



does not cut the X-axis

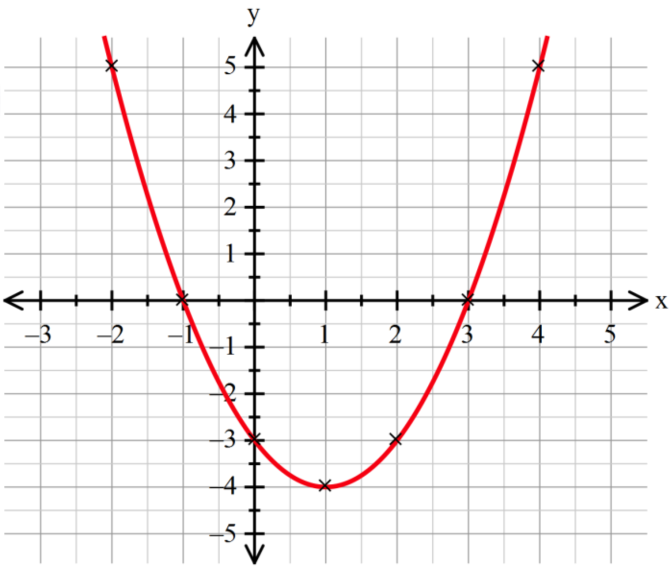


Represent graphically the function f where $f(x) = x^2 - 2x - 3$ where $x \in [-2, 4]$ then Find a) the point of the vertex of the curve

b) The equation of the axis of symmetry

c) The maximum or minimum value

d) The S.S of the equation $x^2 - 2x - 3 = 0$



Solution

start end Step

mode →table→ $f(x) = x^2 - 2x - 3 \rightarrow -2 \rightarrow 4 \rightarrow 1$

x	-2	-1	0	1	2	3	4
$f(x)$	5	0	-3	-4	-3	0	5

The point of the Vertex $(1, -4)$

Equation of sym. is $X = 1$

Minimum value of the function $= -4$

$S.S = \{-1, 3\}$

2nd General formula

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

Where a *is the coefficient of* x^2
b *is the coefficient of* x
c *is the abslute term*

By using general formula find the S.S.

1) $2x^2 - 4x = -1$, then aproximate the result to the nearest two decimal digit

Solution

$2x^2 - 4x + 1 = 0$

$\therefore\ a = 2$, $b = -4$ and $c = 1$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4\times2\times1}}{2\times2}$$

$\frac{2+\sqrt{2}}{2}$ $\frac{2-\sqrt{2}}{2}$

S.S. $=\{ 1.71 , 0.29 \}$

2) $2x^2 - 4x = -1$ where $\sqrt{2} = 1.4$

Solution

$2x^2 - 4x + 1 = 0$

$\therefore\ a = 2$, $b = -4$ and $c = 1$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2-4\times2\times1}}{2\times2}$$

$\frac{2+\sqrt{2}}{2} = \frac{2+1.4}{2} = 1.7$ $\frac{2-\sqrt{2}}{2} = \frac{2-1.4}{2} = 0.3$

S.S. $=\{ 1.7 , 0.3 \}$

3) $x^2 + 3x + 5 = 0$

Solution

$\therefore\ a = 1$, $b = 3$ and $c = 5$

$$x = \frac{-(3) \pm \sqrt{(3)^2 - 4\times1\times5}}{2\times1}$$

$s.s = \emptyset$

4) $2x^2 = 3(2 - x)$

Solution

$2x^2 = 6 - 3x$

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

$\therefore a = 2$, $b = 3$ and $c = -6$

....
....
....
....

5) $x(x - 1) = 4$

Solution

$x^2 - x = 4$

$x^2 - x - 4 = 0$

$\therefore a = 1$, $b = -1$ and $c = -4$

....
....
....
....

Homework

[1] Represent graphically the function $f: f(x) = x^2 - 2x$ in the interval $[-1, 3]$, from the graph find the S.S. of the equation: $x^2 - 2x = 0$ (Suez 12)

[2] Graph the function $f: f(x) = x^2 + 2x + 1$ in the interval $[-4,2]$ and from the graph, find the solution set of the equation : $x^2 + 2x + 1 = 0$

[3] Graph the function $f: f(X) = x^2 - 4x + 3$ on the interval $[-1,5]$ and from the graph, find

1) The minimum value of the function.

2) The equation of the axis of symmetry.

3) The S.S. of the equation $f(\mathcal{X}) = 0$

[4] Draw the graphical representation of the function f in the given interval, then find the solution set of the equation $f(x) = 0$:

1) $f(x) = x^2 - 2x - 4$ in the interval $[-2, 4]$
2) $f(x) = 2x^2 + 5x$ in the interval $[-4, 2]$
3) $f(x) = 3x - x^2 + 2$ in the interval $[-1, 4]$
4) $f(x) = x(x - 5) + 3$ in the interval $[0, 5]$
5) $f(x) = 2x^2 - 3(2 - x)$ in the interval $[-3, 2]$

[5] Find in $\mathbb{R}$ the S.S. of each of the following equations using the general formula :

1) $x^2 + 7x + 2 = 0$ approximating the result to the nearest tenth.

2) $x^2 - 4x + 1 = 0$ approximating the result to the nearest two decimal digits.

3) $2x^2 - 4x + 1 = 0$ rounding the result to three decimal digits.

4) $3x^2 - 6x + 1 = 0$ rounding the result to the nearest three decimals.

5) $x^2 + 5x = 0$

6) $x^2 + 3x + 5 = 0$

7) $x^2 + 8x + 9 = 0$, where $\sqrt{7} \approx 2.65$

8) $2x^2 - x - 2 = 0$, where $\sqrt{17} \approx 4.12$

[6] Find in $\mathbb{R}$ the solution set of each of the following equations using the general formula approximating the result to three decimal digits :

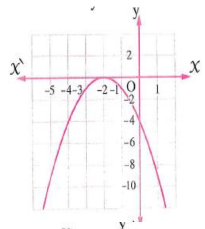
1) $2x^2 - 10x = 1$
2) $x(x - 1) = 4$
3) $2x^2 = 3(2 - x)$
4) $(x - 3)^2 - 5x = 0$
5) $x + \frac{4}{x} = 6$
6) $\frac{8}{x^2} + \frac{1}{x} = 1$
7) $\frac{x}{3} = \frac{1}{5-x}$
8) $\frac{x^2}{9} - \frac{4}{3}x = -2$

[7] Choose the correct answer from those given:

1) The opposite figure represents the curve of a quadratic function f, then the solution set of the equation $f(X)=0$ in $\mathbb{R}$ is ………………..

(a) $\emptyset$ (b) $\{1\}$ (c) $\{0\}$ (d) $\{(0,1)\}$

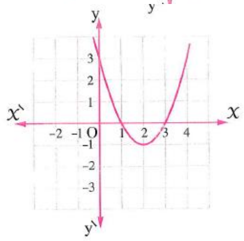
2) In the opposite figure :The S.S. of the equation $f(X)=0$ in $\mathbb{R}$ is ……….



(a) $\{-2\}$ (b) $\{-2,4\}$

(c) $\{4\}$ (d) $\emptyset$

3) In the opposite figure : The S.S. of the equation $f(x)=0$ in $\mathbb{R}$ is ………



(a) $(2,-1)$ (b) $\{(3,1)\}$

(c) $\{3,1\}$ (d) $(3,0)$

4) If the curve of the quadratic function f passes through the points $(-1,0)$, $(0,-4)$, $(4,0)$ and $(0,-6)$, then the solution set of the equation $f(X)=0$ in $\mathbb{R}$ is …………..

(a) $\{-1,0\}$ (b) $\{-4,0\}$ (c) $\{-1,4\}$ (d) $\{4,-4\}$

5) The curve of the function $f: f(X)=x^2-5x$ intersects the X-axis at the two points ……….

(a) $(2,0),(0,5)$ (b) $(0,0),(5,0)$ (c) $(2,0),(-5,0)$ (d) $(0,0),(-5,0)$

6) If the S.S. of the equation : $4x^2+4x+\mathrm{k}=0$ is $\left\{-\frac{1}{2}\right\}$, then $\mathrm{k}=$ …………..

(a) 2 (b) 1 (c) -1 (d) -8

7) If $x=3$ is one of the solutions of the equation : $x^2-\mathrm{a}x-6=0$, then $\mathrm{a}=$ …………..

(a) 3 (b) 2 (c) 1 (d) -1

8) In the equation: $\mathrm{a}x^2+\mathrm{b}x+\mathrm{c}=0$, if $\mathrm{b}^2-4\mathrm{ac}>0$, then this equation has …… roots in $\mathbb{R}$

(a) 1 (b) 2 (c) zero (d) an infinite number

9) In the equation : $\mathrm{a}x^2+\mathrm{b}x+\mathrm{c}=0$, if $\mathrm{b}^2-4\mathrm{ac}=0$, then the number of real solutions of the equation equals …………..

(a) 1 (b) 2 (c) zero (d) an infinite number

10) In the equation : $\mathrm{a}x^2+\mathrm{b}x+\mathrm{c}=0$, if $\mathrm{b}^2-4ac<0$, then the number of roots of the equation in $\mathbb{R}$ equals …………..

(a) 1 (b) 2 (c) zero (d) an infinite number

11) If $x\in\mathbb{R}$, then the equation : $x^2+x+1=0$ has …………

(a) two roots. (b) one root. (c) no roots. (d) an infinite number of roots.