

**Foundation stage 1:**

1. (a) Sketch  $f(x) = x^2$  in **black**,  $g(x) = (x-1)^2$  in **blue** and  $y = (x+1)^2$  in **red** on the given number plane.

(b) Hence, describe the type of translation maps:

(i)  $f(x) = x^2$  to  $g(x) = (x-1)^2$ .

—

(ii)  $f(x) = x^2$  to  $h(x) = (x+1)^2$ .

—

2. (a) Sketch  $f(x) = x^2$  in **black**,  $g(x) = x^2 - 1$  in **blue** and  $h(x) = x^2 + 1$  in **red** on the given number plane.

(b) Hence, describe the type of translation maps:

(i)  $f(x) = x^2$  to  $g(x) = x^2 - 1$

—

(ii)  $f(x) = x^2$  to  $h(x) = x^2 + 1$

—

3. (a) Sketch  $f(x) = x^2$  in **black**,  $g(x) = (x-1)^2 + 2$  in **blue** and  $h(x) = (x+1)^2 - 2$  in **red** on the given number plane.

(b) Hence, describe the type of translation maps:

(i)  $f(x) = x^2$  to  $g(x) = (x-1)^2 + 2$ .

—

(ii)  $f(x) = x^2$  to  $h(x) = (x+1)^2 - 2$ .

—

4. Sketch the following cubic graphs with intercepts by using translation:

(a)  $y = (x-1)^3$

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(b)  $y = (x+2)^3$

JB MATHS

JB MATHS

(c)  $y = x^3 - 3$

JB MATHS

(d)  $y = x^3 + 4$

JB MATHS

5. Sketch the following hyperbolas with intercepts by using translation:

(a)  $y = \frac{1}{x-1}$

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(b)  $y = \frac{1}{x+2}$

JB MATHS

(c)  $y = \frac{1}{x} - 3$

JB MATHS

(d)  $y = \frac{1}{x} + 4$

JB MATHS

JB MATHS

JB MATHS

6. Sketch the following circles with center and intercepts by using translation:

(a)  $(x-1)^2 + y^2 = 1$

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(b)  $x^2 + (y+2)^2 = 1$

JB MATHS

(c)  $(x-1)^2 + (y+2)^2 = 1$

JB MATHS

(d)  $(x+1)^2 + (y-2)^2 = 1$

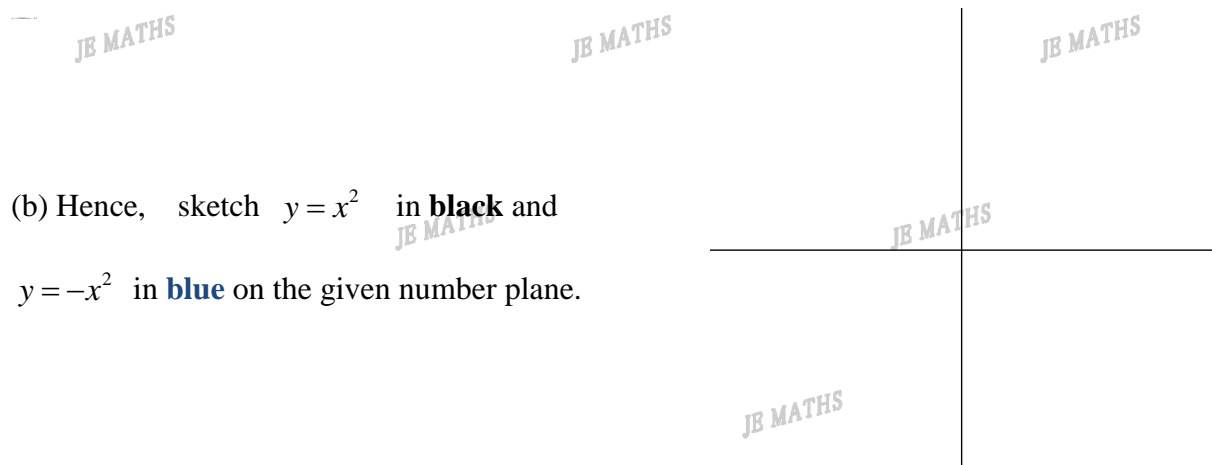
JB MATHS

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**Foundation stage 2:**

1. Given that the parabola  $y = x^2$ .

(a) By replacing  $y$  by  $-y$ , show that  $y = -x^2$ .

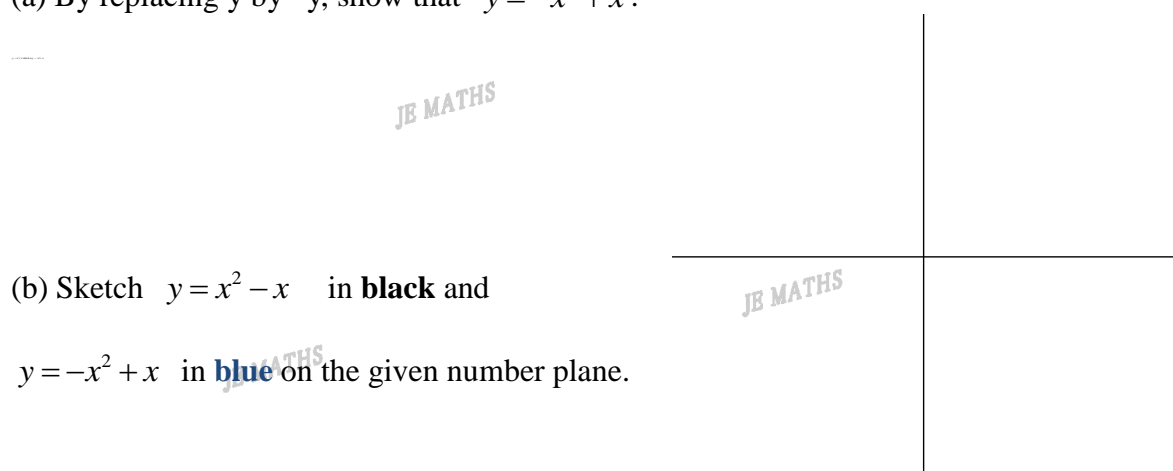


(b) Hence, sketch  $y = x^2$  in **black** and  $y = -x^2$  in **blue** on the given number plane.

(c) Hence, describe the type of translation maps  $y = x^2$  to  $y = -x^2$ .

2. Given that the parabola  $y = x^2 - x$ .

(a) By replacing  $y$  by  $-y$ , show that  $y = -x^2 + x$ .



(b) Sketch  $y = x^2 - x$  in **black** and  $y = -x^2 + x$  in **blue** on the given number plane.

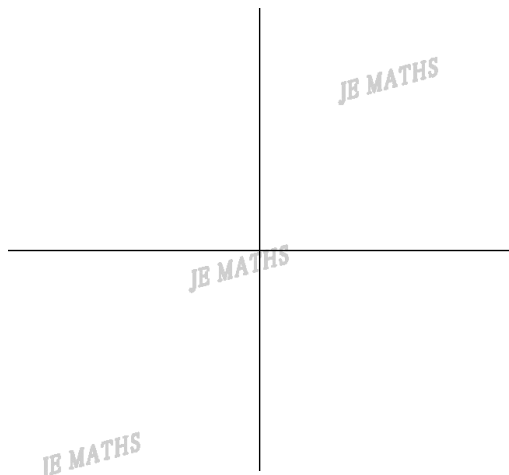
(c) Hence, describe the type of translation maps  $y = x^2 - x$  to  $y = -x^2 + x$ .

3. Given that the parabola  $y = \frac{1}{x-1}$ .

(a) By replacing  $x$  by  $-x$ , show that  $y = -\frac{1}{x+1}$ .

.....

(b) Hence, sketch  $y = \frac{1}{x-1}$  in **black** and  $y = -\frac{1}{x+1}$  in **blue** on the given number plane.



(c) Hence, describe the type of translation maps  $y = \frac{1}{x-1}$  to  $y = -\frac{1}{x+1}$ .

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4. Given that the parabola  $y = 2^x$ .

(a) By replacing  $x$  by  $-x$ , show that  $y = 2^{-x}$ .

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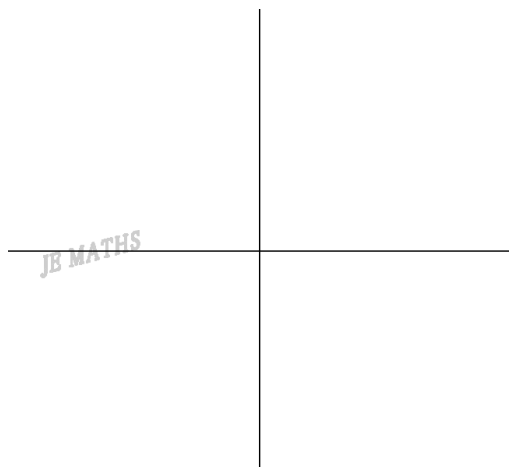
(b) By replacing  $y$  by  $-y$ , show that  $y = -2^x$ .

.....

(d) Hence, sketch  $y = 2^x$  in **black**,

$y = 2^{-x}$  in **blue** and  $y = -2^x$  in **red**

on the given number plane.



(e) Hence, describe the type of translation maps:

(i)  $y = 2^x$  to  $y = 2^{-x}$

(ii)  $y = 2^x$  to  $y = -2^x$

.....

.....

5. Given that a parabola of  $y = x^2 - 4x + 3$ .

(a) Sketch this parabola by indicating the turning point and intercepts.

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(b) Find the function of the new parabolas and sketch them on the given number plane by indicating turning point and intercepts, if the original parabola is reflected by

(i) x-axis.

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(ii) y-axis.

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(iii) both axes.

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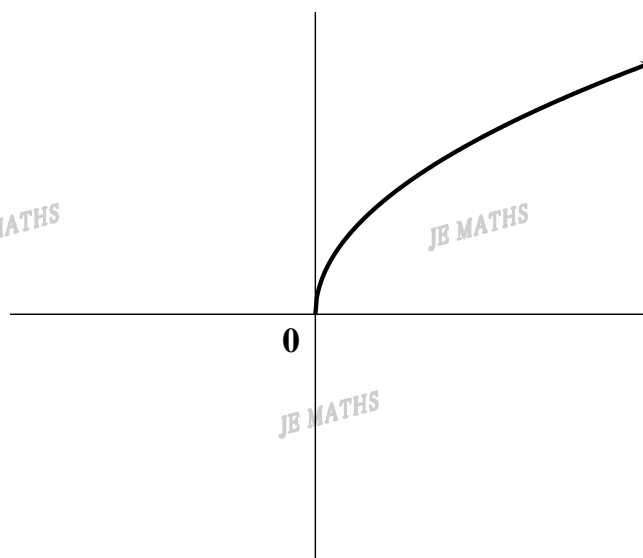
JE MATHS

6. Given that the curve  $y = f(x)$  in **black**.

(a) Sketch the curve  $f(-x)$  in **blue**.

(b) Sketch the curve  $-f(x)$  in **red**.

(c) Sketch the curve  $-f(-x)$  in **green**.

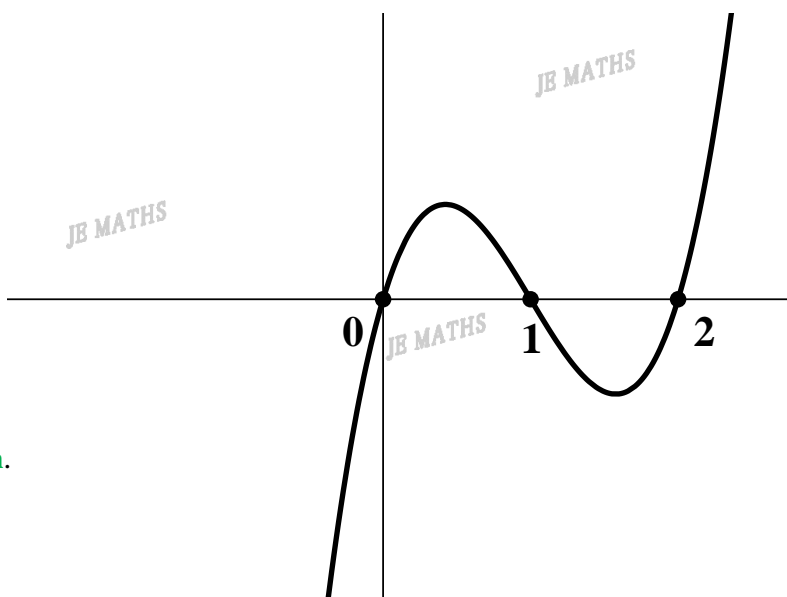


7. Given that the curve  $y = g(x)$  in **black**.

(a) Sketch the curve  $g(-x)$  in **blue**.

(b) Sketch the curve  $-g(x)$  in **red**.

(c) Sketch the curve  $-g(-x)$  in **green**.



8. Find the new equation of the following function:

(a)  $y = x^3$  is reflected by x-axis.

(b)  $y = x^3 - x$  is reflected by y-axis.

(b)  $y = 3^x$  is reflect by x and y-axis.

(d)  $y = \frac{1}{x+1}$  is rotated by  $180^\circ$

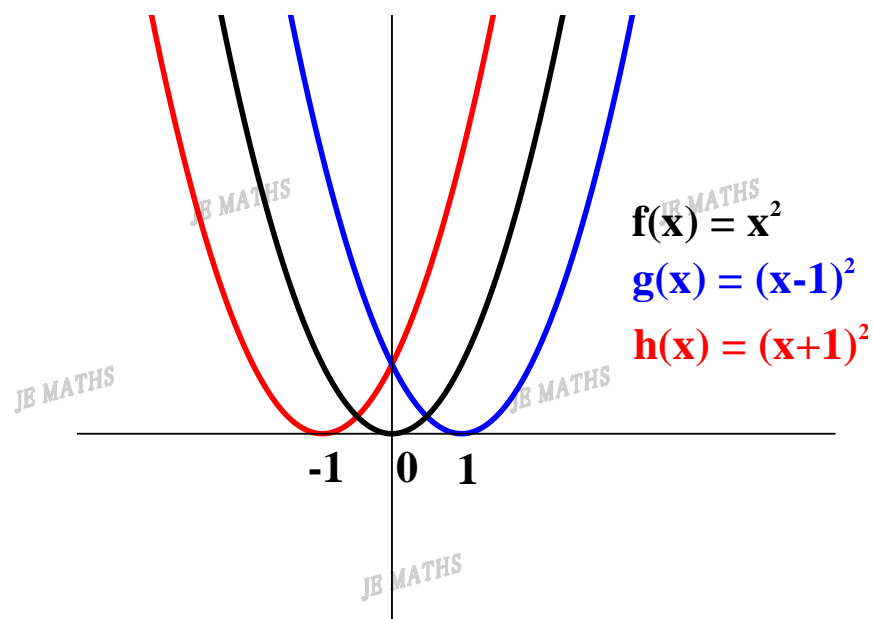
**Foundation stage 1:**

1. (a) Sketch.

(b)

(i) 1 unit right

(ii) 1 unit left

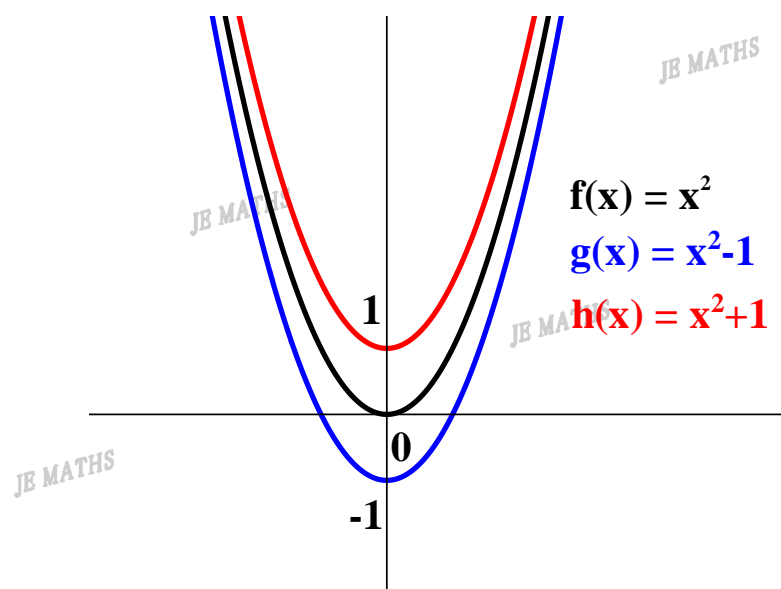


2. (a) Sketch.

(b)

(i) 1 unit down

(ii) 1 unit up

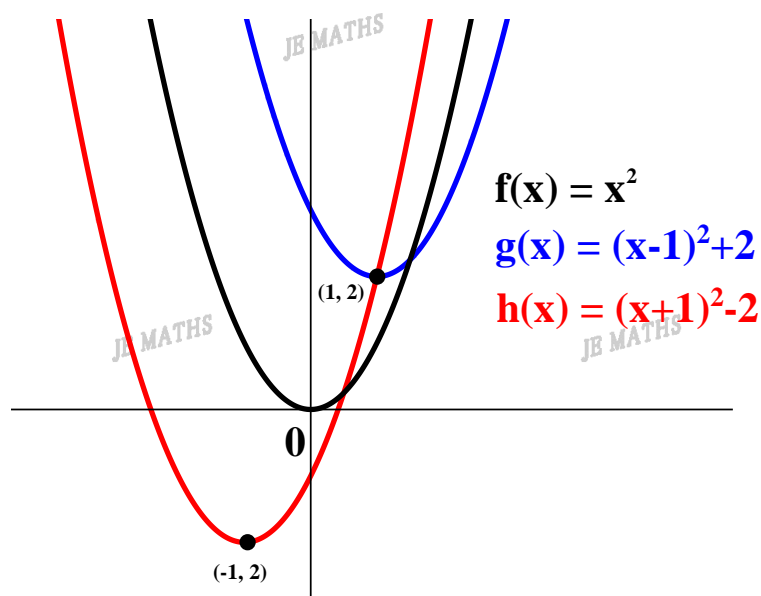


3. (a) Sketch.

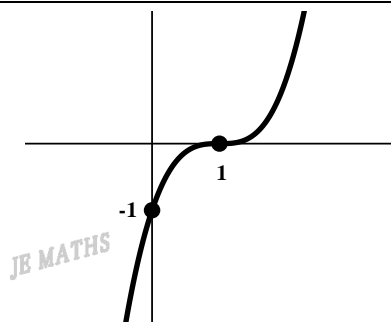
(b)

(i) 1 unit right and 2 units up

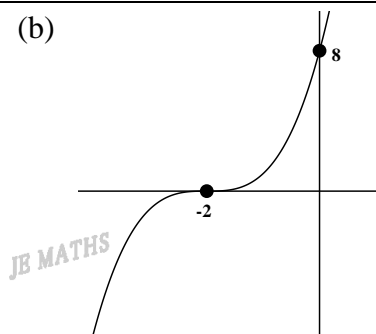
(ii) 1 unit left and 2 units down



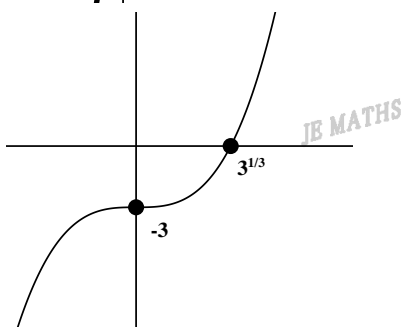
4. (a)



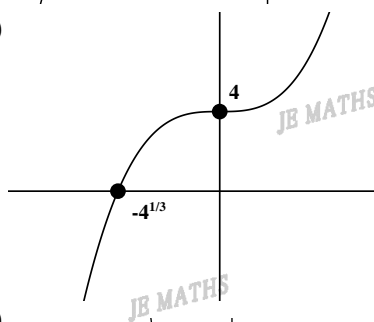
(b)



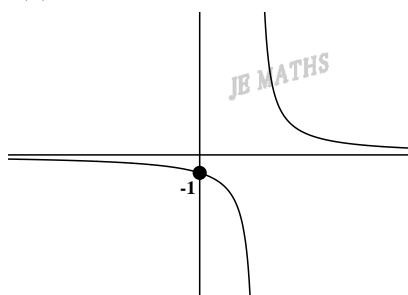
(c)



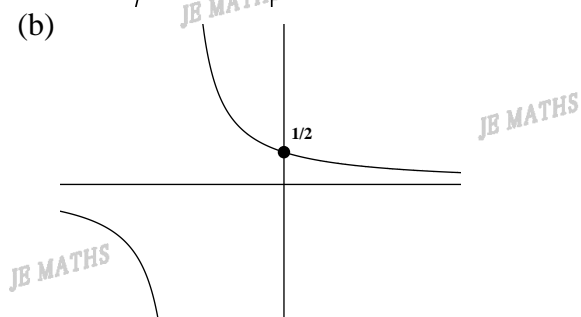
(d)



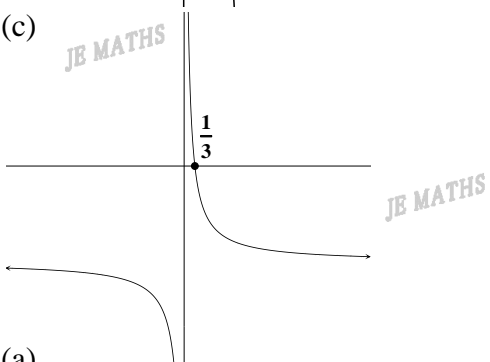
5. (a)



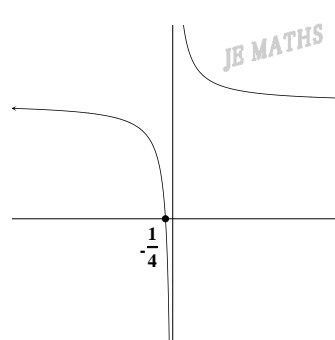
(b)



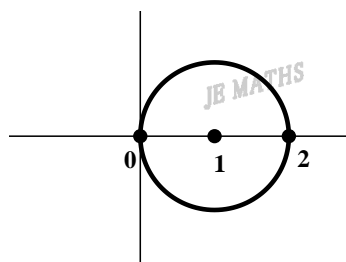
(c)



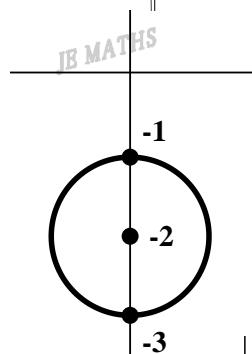
(d)



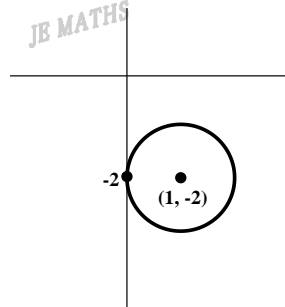
6. (a)



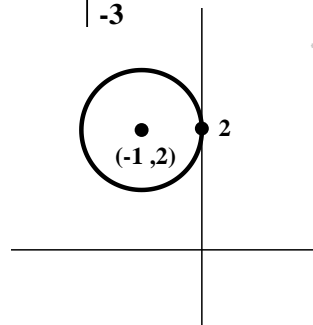
(b)



(c)



(d)



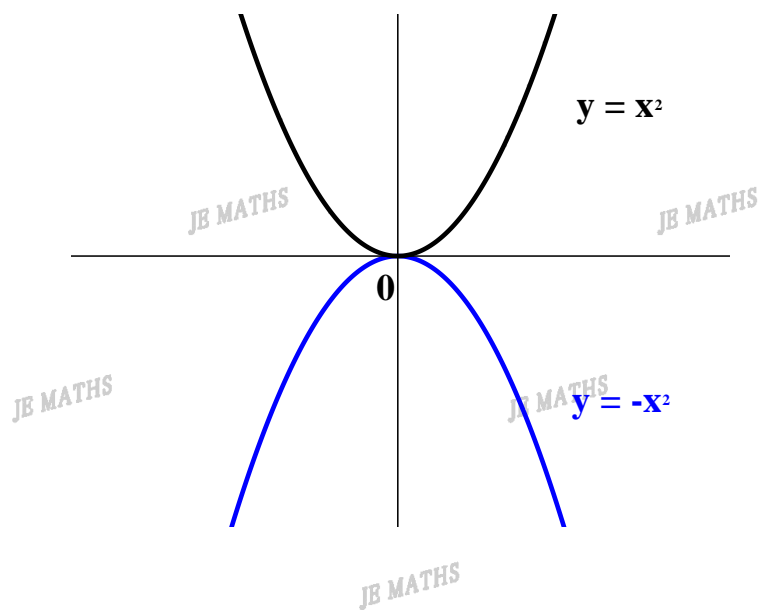


**Foundation stage 2:**

1. (a)  $-y = x^2$  which is  $y = -x^2$

(b) Sketch.

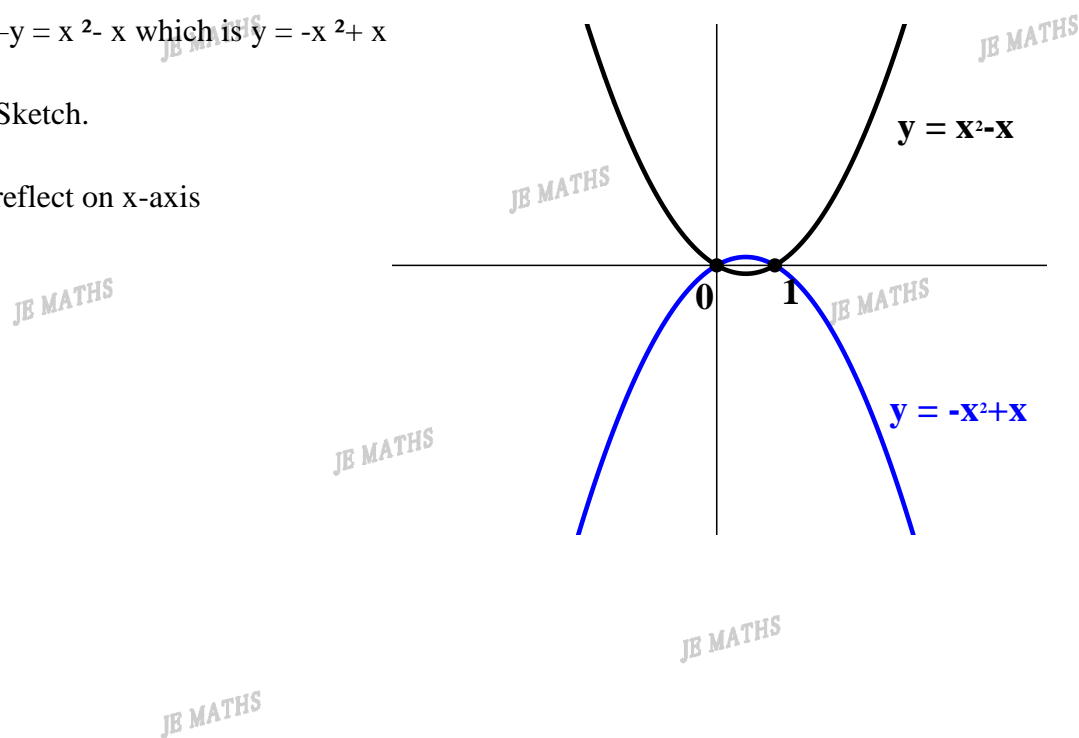
(c) reflect on x-axis



2. (a)  $-y = x^2 - x$  which is  $y = -x^2 + x$

(b) Sketch.

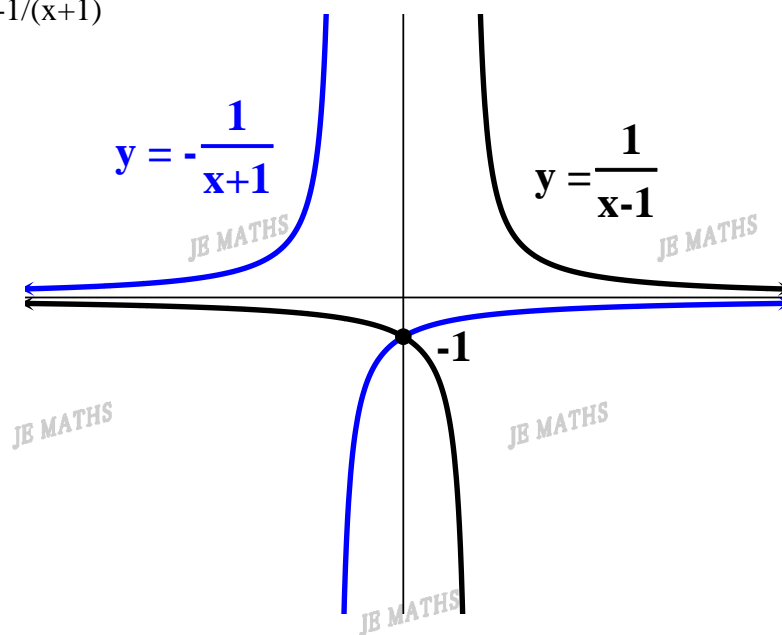
(c) reflect on x-axis



3. (a)  $y = 1/(-x-1)$  which is  $y = -1/(x+1)$

(b) Sketch.

(c) reflect on y-axis



4. (a)  $y = 2^{-x}$

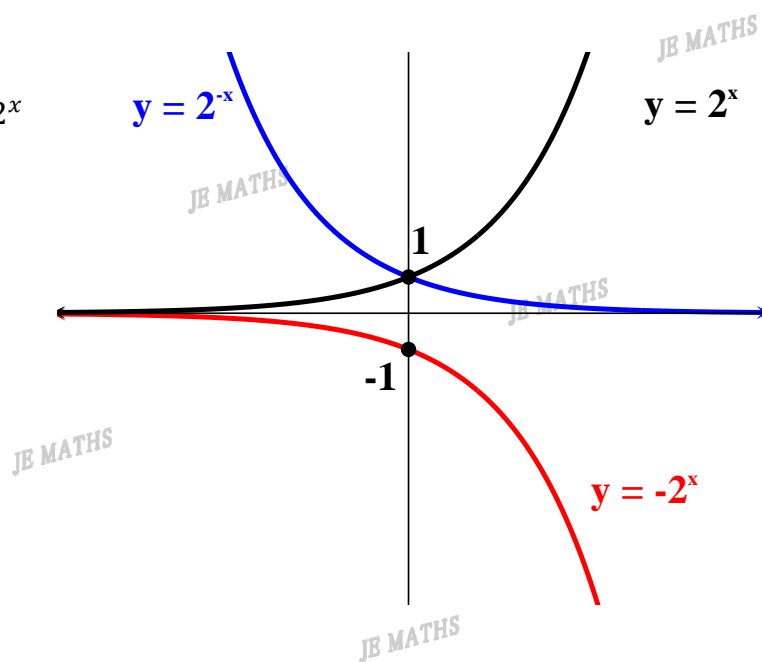
(b)  $-y = 2^x$  which is  $y = -2^x$

(c) Sketch.

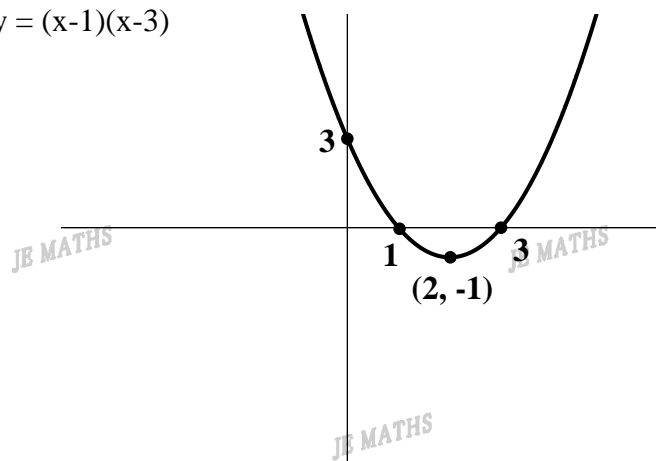
(d)

(i) reflect on y-axis

(ii) reflect on x-axis



5. (a)  $y = (x-1)(x-3)$

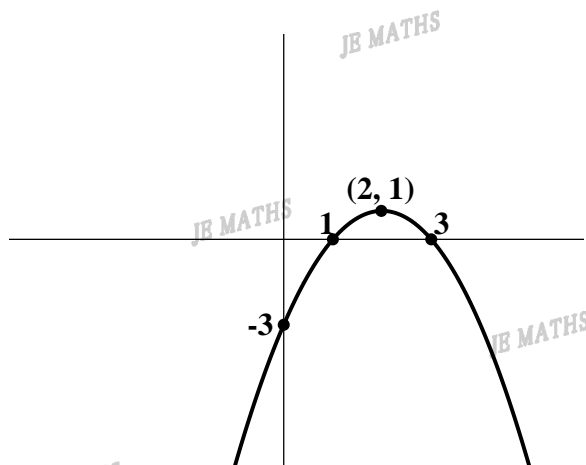


(b)

(i)  $y$  by  $-y$ ,

$$-y = (x-1)(x-3)$$

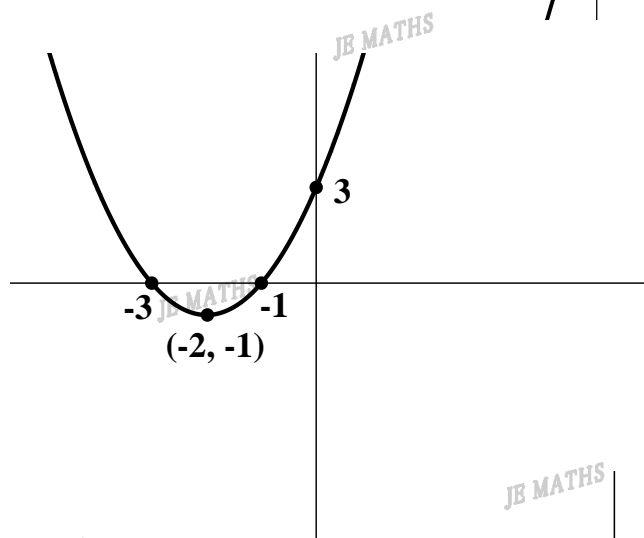
$$y = -(x-1)(x-3)$$



(ii)  $x$  by  $-x$ ,

$$y = (-x-1)(-x-3)$$

$$y = (x+1)(x+3)$$

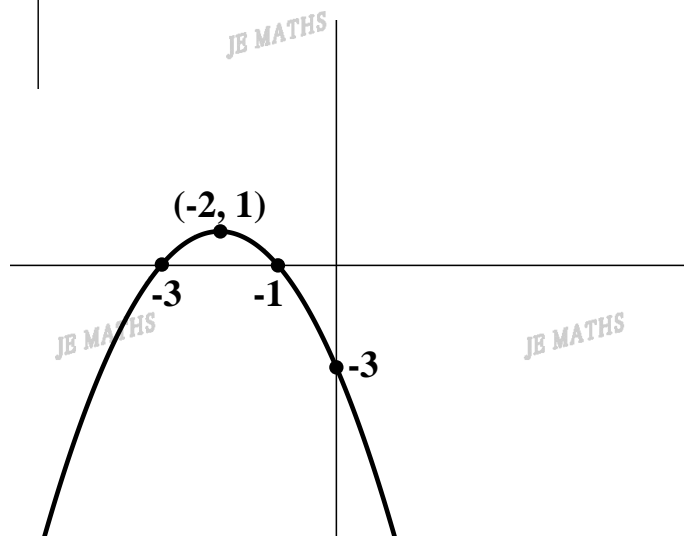


(iii)

$y$  by  $-y$  and  $x$  by  $-x$

$$-y = (-x-1)(-x-3)$$

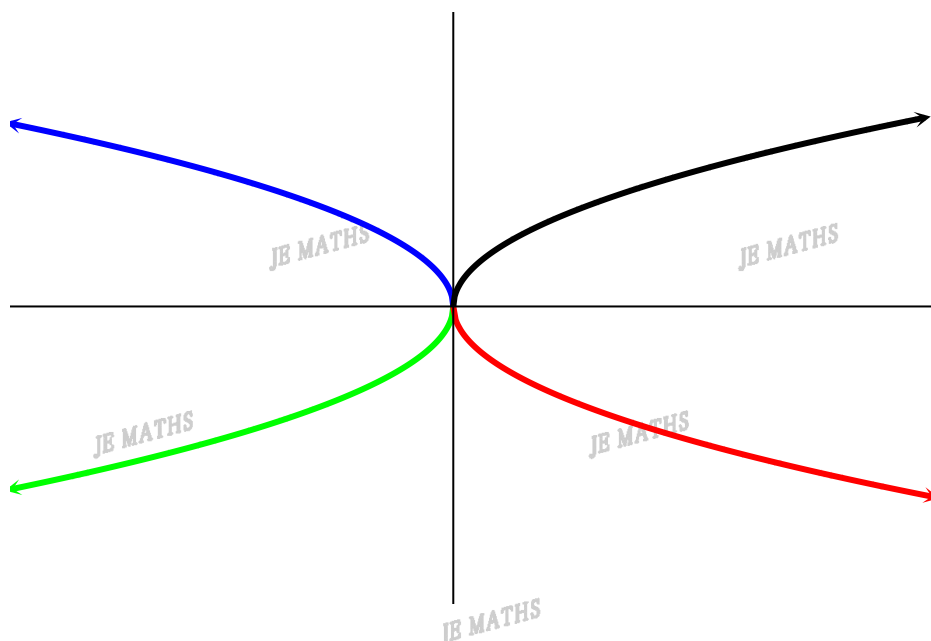
$$y = -(x+1)(x+3)$$



6. (a) Sketch.

(b) Sketch.

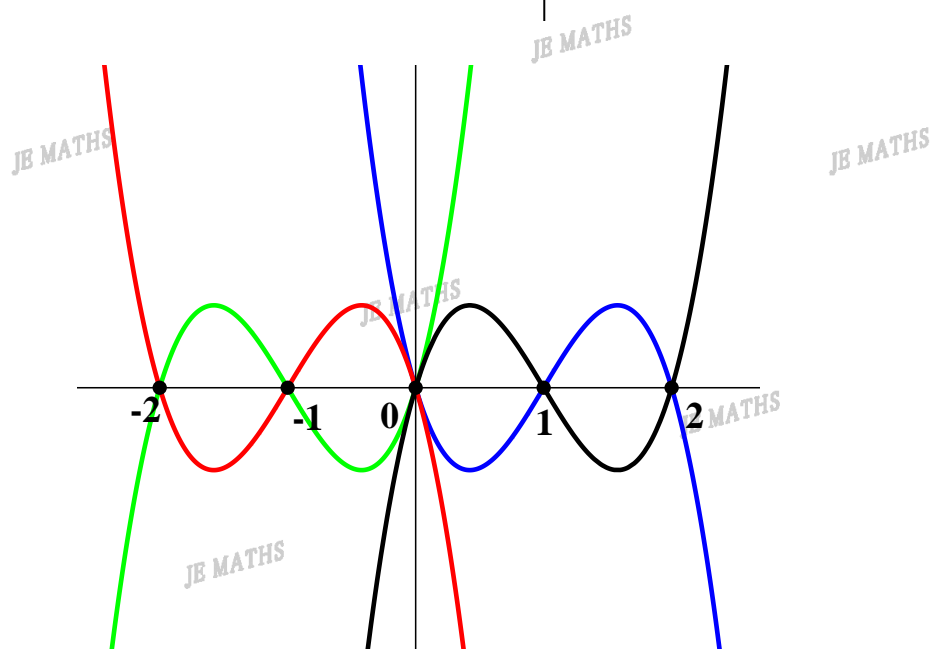
(c) Sketch.



7. (a) Sketch.

(b) Sketch.

(c) Sketch.



8. (a)  
y by  $-y$ ,  
 $-y = x^3$  which is  $y = -x^3$

(b)  
x by  $-x$  and y by  $-y$ ,  
 $-y = 3^{-x}$   
which is  $y = -3^{-x}$

(b)  
x by  $-x$ ,  
 $y = (-x)^3(-x)$  which is  $y = -x^3 + x$

(d)  
x by  $-x$  and y by  $-y$ ,  
 $-y = 1/(-x+1)$   
which is  $y = -1/(-x+1)$   
 $y = 1/(x-1)$