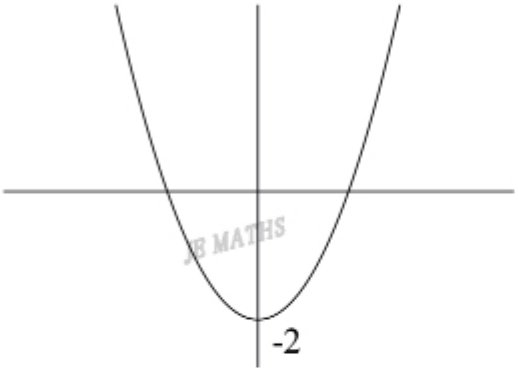
1. (a) f(-x)=2(-x) ²=2x ²

   (b) f(-x)=(-x)^4-(-x)=x^4+x

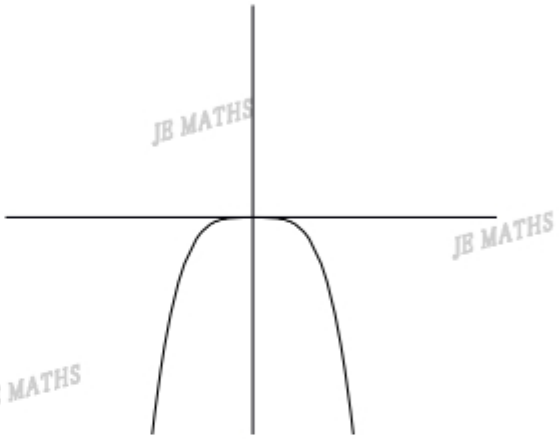
   (c) f(-x)=(-x) ³+3(-x)=-x ³-3x

   (d) f(-x)=(-x)^5-(-x) ³+1=-x^5+x ³+1

2. (a)
   f(-x)=(-x) ²2 =x ²2=f(x)
   Sketch f(x) = x ²- 2

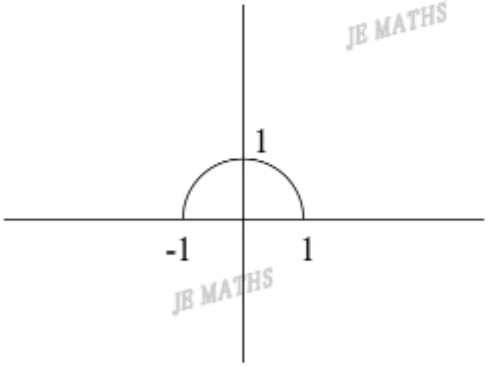


   (b)
   f(-x)=-(-x)^4= -x^4 = f(x)
   Sketch f(x) = -x^4



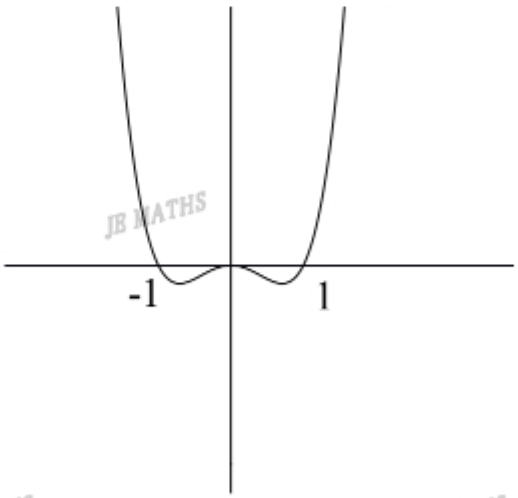
   (c)

   f(-x)=√[1-(-x) ³]=√(1-x ³)=f(x)
   Sketch √(1-x ³)



   (d)

   f(-x)=(-x)^4-(-x) ²= x^4-x ²= f(x)
   Sketch f(x) = x ⁴(x ²-1)=x ⁴(x+1)(x-1)



3. (a) -f(x)=-2^x

   (b) -f(x)=-1/(x+1)

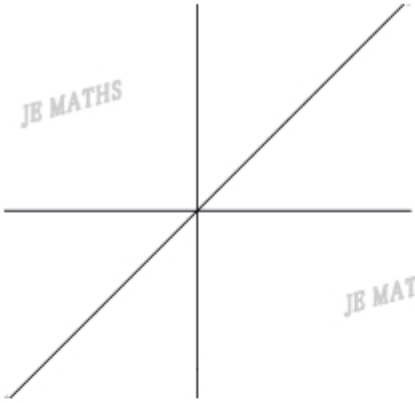
   (c) -f(x)=-(x ³x+1)=-x ⁴x-1

   (d) -f(x)=-x/(x ²+1)

4. (a)

f(-x) = -x=-f(x)

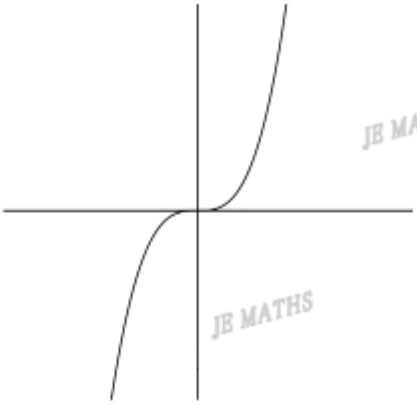
Sketch f(x) = x



(b)

f(-x) = 3(-x) ³=-3x ³=-f(x)

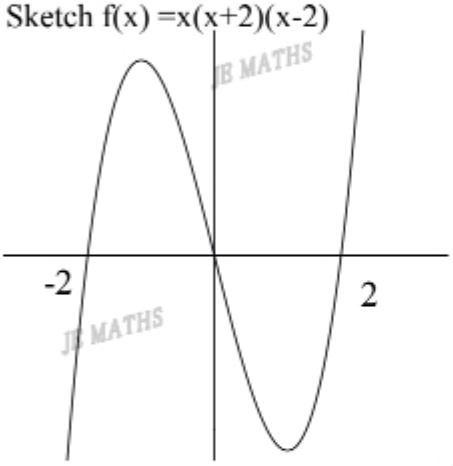
Sketch f(x) = 2x ³



(c) $f(x) = x^3 - 4x$

f(-x)=(-x) ³4(-x)=-(x ³4x)=-f(x)

Sketch f(x) =x(x+2)(x-2)

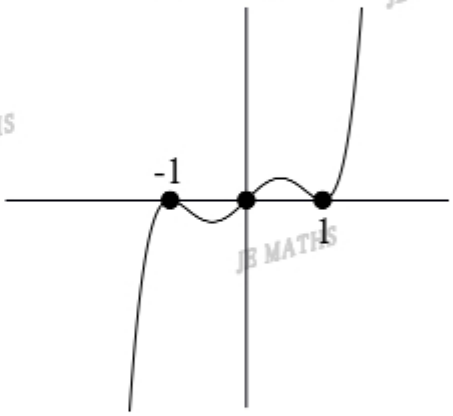


(d)

f(-x)=(-x)^5-2(-x) ³+(-x)=-x^5+2x ³

= -(x^5-2x ³+x)=-f(x)

Sketch f(x) =x(x ²1) ²=x(x-1) ²(x+1) ²



5. (a)

f(-x) = (-x) ²+2^(-x)

= x ²+2^-x≠f(x)

≠-f(x)

Neither even nor odd.

(b)

f(-x)=(-x)^4-2(-x) ²+1

=x^4-2x ²+1

=f(x)

Even.

(c)

f(-x) = 3^(-x)-3^x

= -[3^x-3^(-x)]

= -f(x)

Odd.

(d)

sub -x in, (-x) ²y ²=x ²y ²=1

meets →even

sub -x and -y in, (-x) ²(-y) ²=x ²y ²=1

meets →odd

Both even and odd.

6. (a) Let: f(x) is even, then f(-x)=f(x); g(x) is even, then g(-x)=g(x)
h(-x) =f(-x)+g(-x) (since f(-x)=f(x) and g(-x)=g(x))
= f(x)+g(x) = h(x)
h(x) is even.

(b) Let: f(x) is odd, then f(-x)=-f(x); g(x) is odd, then g(-x)=-g(x)
h(-x) =f(-x)+g(-x) (since f(-x)=f(x) and g(-x)=g(x))
= -f(x)-g(x) = -[f(x)+g(x)] = - h(x)
h(x) is odd.

(c) Let: f(x) is even, then f(-x)=f(x); g(x) is odd, then g(-x)=-g(x)
h(-x) =f(-x)+g(-x) (since f(-x)=f(x) and g(-x)=g(x))
= f(x)-g(x) $\neq$ h(x)
$\neq$ -h(x)
h(x) is neither even nor odd.

7. (a) 7

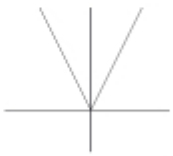
(b) 7

(c) |4|=4

(d) |-4|=4

8. (a) Graph $y = |2x|$ by using a table of values.

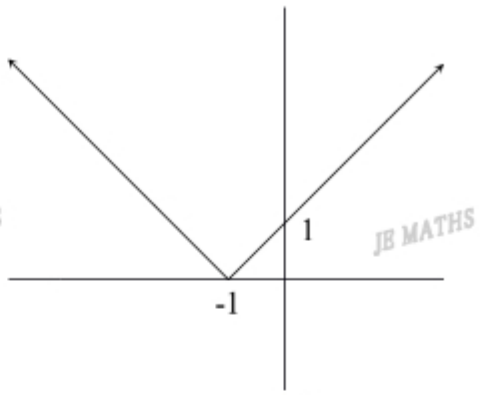
x	-2	-1	0	1	2
|2x|	4	2	0	2	4



(b) Write down the equations of the two branches.
y = 2x, 2x≥0, x≥0
y = -2x, 2x<0, x<0

9. (a) Sketch.

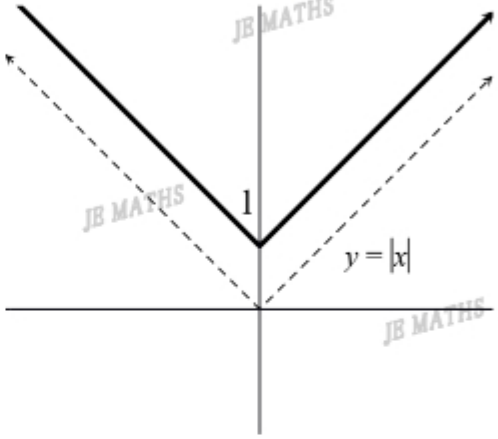
x	-2	-1	0	1	2
|x+1|	1	0	1	2	3



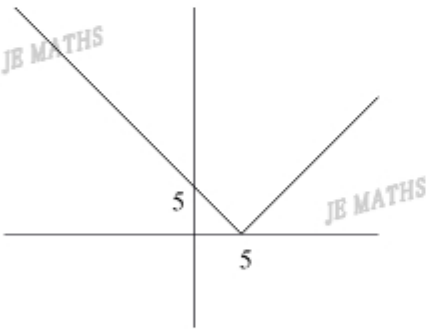
(b) $y = x+1$, $x+1 \geq 0$, $x \geq -1$
$y = -(x+1) = -x-1$, $x+1 < 0$, $x < -1$

(c) $x \rightarrow x+1$, translate 1 unit left.

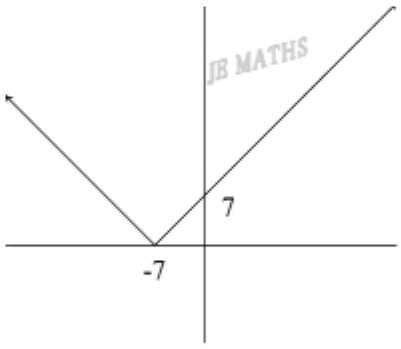
(d) Sketch.



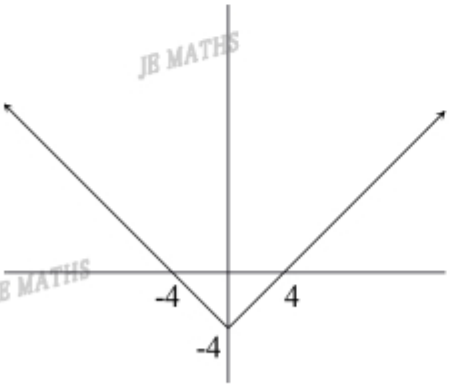
10. (a)



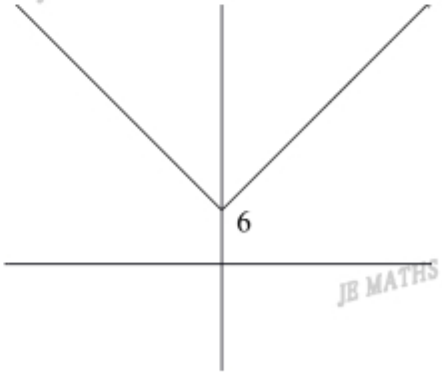
(b)



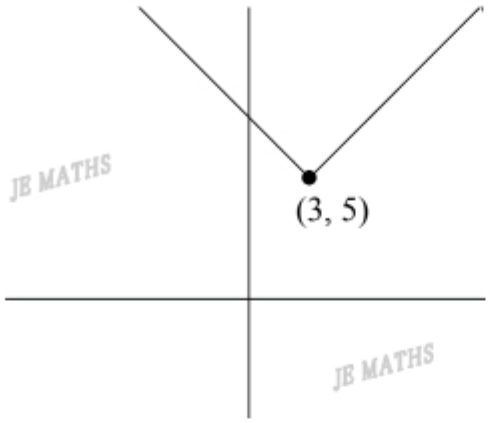
(c)



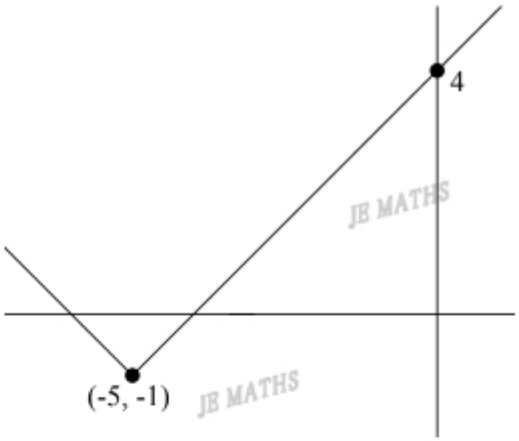
(d)



11. (a)



(b)



12. (a)
y →-y, reflect in the x-axis

(b)
y = |-(x+2)|=|-x-2|
x→-x, reflect in the y-axis

13. (a)
y=5x, x≥0
y=-5x, x<0

(b)
y=-2x, x≥0
y=2x, x<0

(c)
y=x+8, x+8≥0, x≥-8
y=-(x+8)=-x-8, x+8<0, x<-8

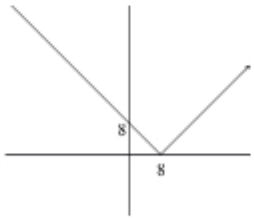
(d)
y=x-10, x-10≥0, x≥10
y=-(x-10)=-x+10, x-10<0, x<10

14. Given that $y = |8 - x|$.

(a) Rewrite the function by using the rule $|a - x| = |x - a|$.

y = |x-8|

(b) Hence, sketch it.



15. (a) |-1|=|1|

(b) |2-1|=|1-2|

(c) $|-1|^2 = 1 = (-1)^2$

(d) $\sqrt{(-1)^2} = 1 = |-1|$

16. (a)
$\pm(x+6)=4$
$x+6=\pm4$
$x=\pm4-6=-10, -2$

(b)
$|x-6|=4$
$x-6=\pm4$
$x=\pm4+6=2, 10$

(c)
$(2x-5)=\pm3$
$x=(\pm3+5)/2$
$x=4, 1$

(d)
$(7x-3)=\pm1$
$x=(\pm1+3)/7$
$x=2/7, 4/7$

17. (a)
$x-6=\pm0=0$
$x=6$

(b)
$x+7=0$
$x=-7$

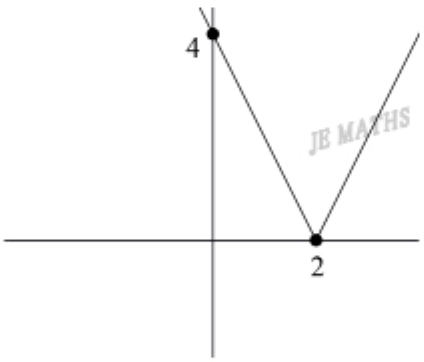
(c)
$3x+9=0$
$x=-3$

(d)
$7x-5=0$
$x=5/7$

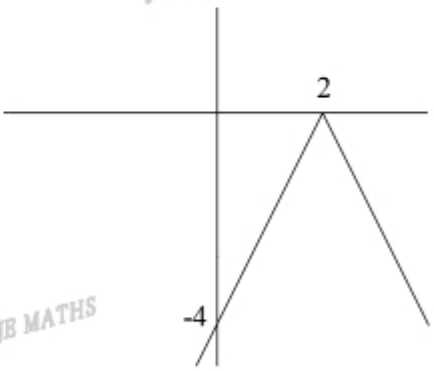
18. (a) x = no solution

(b) x = no solution

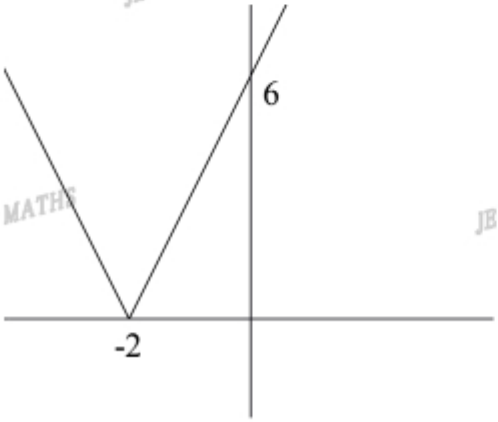
19. (a)



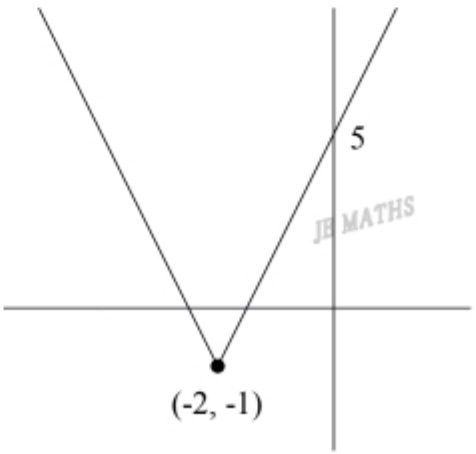
(b)



(c)



(d)



20. (a) $y=|12-6x|=|6x-12|$

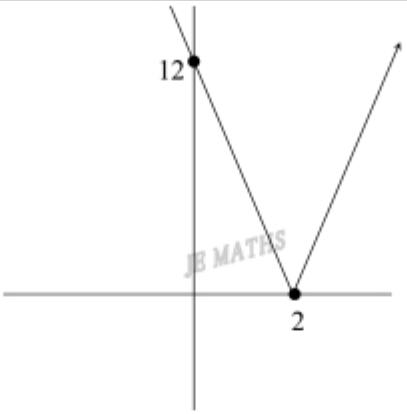
(b) Sketch.

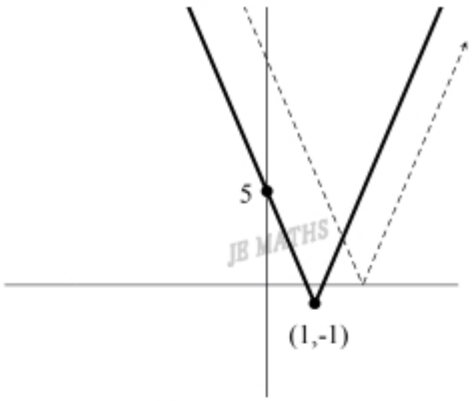
(c) Sketch.

(d) $x \rightarrow x+1$, $y \rightarrow y+1$

$y+1=|6(x+1)-12|$

$y = |6x+6-12|-1=|6x-6|-1$





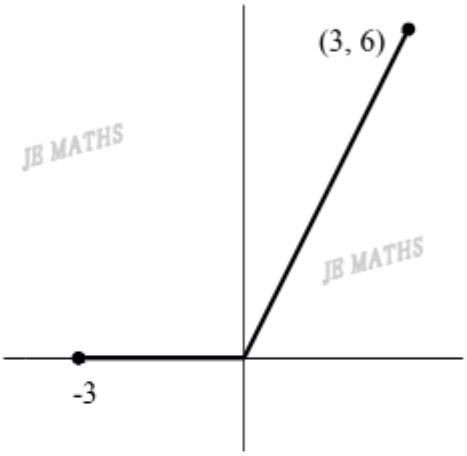
21. (a) $y = x+x = 2x$, $x \geq 0$

$y = -x+x = 0$, $x<0$

(b)

x	**0**	1	2	3
2x	(0)	(2)	(4)	(6)

x	-3	-2	-1	**0**
0	(0)	(0)	(0)	(0)



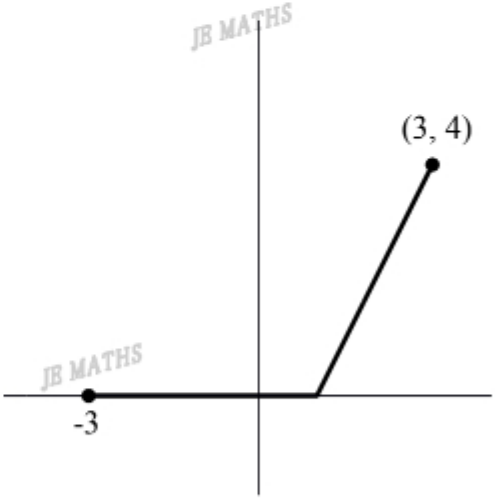
22. (a) $y = x-1+x-1 = 2x-2$, $x-1 \geq 0$, $x \geq 1$

$y = -x+1+x-1 = 0$, $x-1<0$, $x<1$

(b)

x	**1**	2	3
2x-2	(0)	(2)	(4)

x	-3	-2	-1	0	**1**
0	(0)	(0)	(0)	(0)	(0)



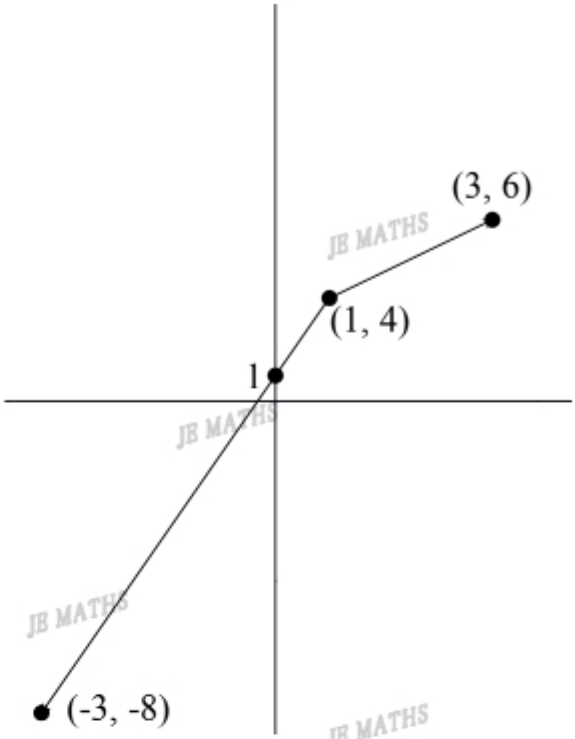
23. Given that $y = 2(x+1) - |x-1|$.

(a) y = 2x+2-(x-1) = x+3, x−1 ≥0, x≥1
y = 2x+2+(x-1) = 3x+1, x-1<0, x<1

(b)

x	**1**	2	3
x+3	(4)	(5)	(6)

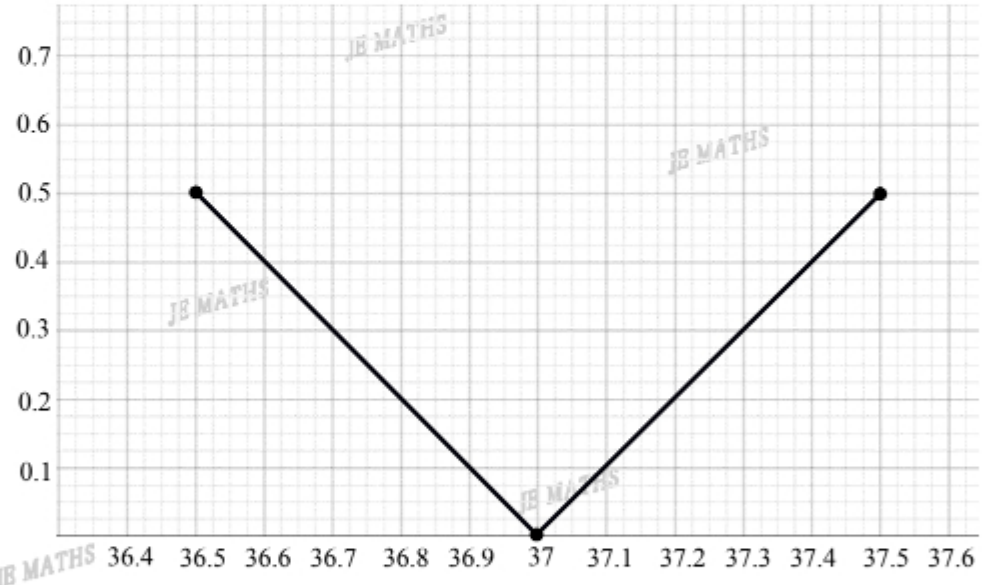
x	-3	-2	-1	0	**1**
3x+1	(-8)	(-5)	(-2)	(1)	(4)



24. (a) y = |x-37|

(b) 0≤y≤0.5

(c) Graph.



(d) (i) 0.42=|x-37|
x-37=±0.42
x=±0.42+37=36.58˚C, 37.42˚C

(ii) 0.39=|x-37|
x-37=±0.39
x=±0.39+37=36.61˚C, 37.39˚C

(iii) Yes, by 0.42-0.39=0.03˚C. Always take the temperature in the same ear.