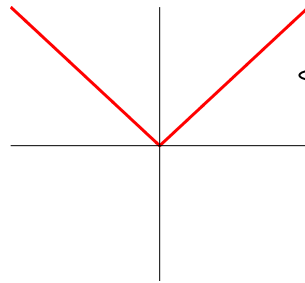


Section 3: The modulus function

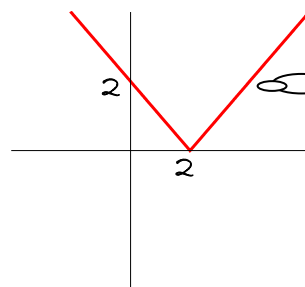
Solutions to Exercise level 1

1. (i)  $y = |x|$



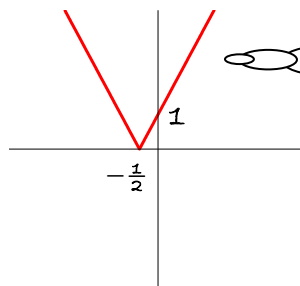
Draw the graph  $y = x$  and reflect negative part in the  $x$ -axis

(ii)  $y = |x - 2|$



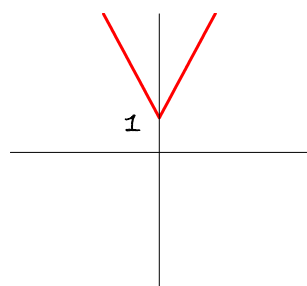
Draw the graph  $y = x - 2$  and reflect negative part in the  $x$ -axis

(iii)  $y = |2x + 1|$



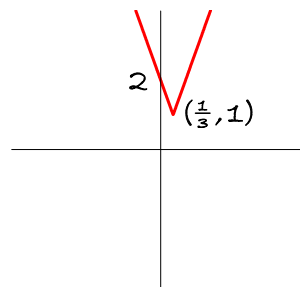
Draw the graph  $y = 2x + 1$  and reflect negative part in the  $x$ -axis

(iv)  $y = 2|x| + 1$



Start with the graph  $y = |x|$ , stretch with scale factor 2 parallel to the  $y$ -axis, and then translate 1 unit vertically upwards.

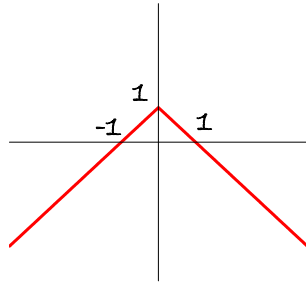
(v)  $y = |3x - 1| + 1$



Draw the graph  $y = 3x - 1$  and reflect negative part in the  $x$ -axis. Then translate graph 1 unit vertically upwards

## Edexcel A level Maths Functions 3 Exercise solutions

(vi)  $y = 1 - |x|$

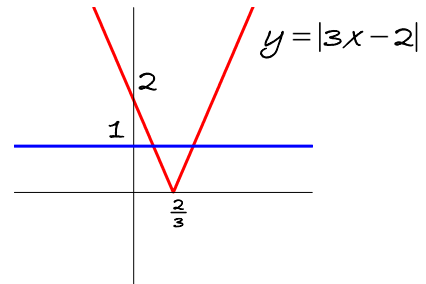


Reflect the graph of  $y = |x|$  in the  $x$ -axis, then translate graph 1 unit vertically upwards

2. (i)  $|3x - 2| = 1$

The graph shows that there are two solutions.

$$\begin{aligned} 3x - 2 &= 1 & -(3x - 2) &= 1 \\ 3x &= 3 & -3x + 2 &= 1 \\ x &= 1 & 3x &= 1 \\ & & x &= \frac{1}{3} \end{aligned}$$

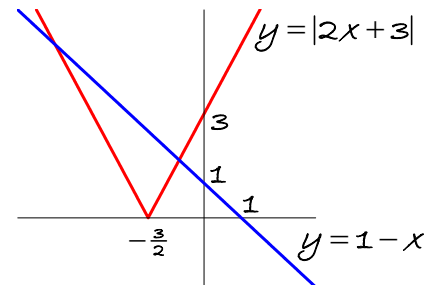


The solutions are  $x = 1$  and  $x = \frac{1}{3}$ .

(ii)  $|2x + 3| = 1 - x$

The graph shows that there are two solutions.

$$\begin{aligned} 2x + 3 &= 1 - x & -(2x + 3) &= 1 - x \\ 3x &= -2 & -2x - 3 &= 1 - x \\ x &= -\frac{2}{3} & -4 &= x \end{aligned}$$

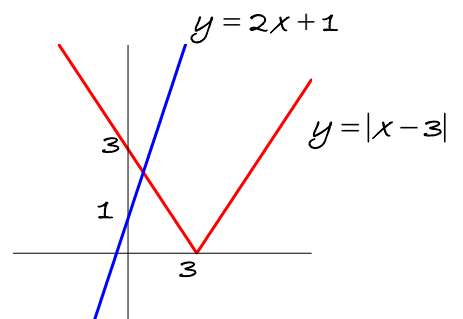


The solutions are  $x = -\frac{2}{3}$  and  $x = -4$ .

(iii)  $|x - 3| = 2x + 1$

The graph shows that there is just one solution and it is in the reflected part of the graph.

$$\begin{aligned} -(x - 3) &= 2x + 1 \\ -x + 3 &= 2x + 1 \\ 2 &= 3x \\ x &= \frac{2}{3} \end{aligned}$$



The solution is  $x = \frac{2}{3}$

## Edexcel A level Maths Functions 3 Exercise solutions

3. (i)  $|x+2| < 4$

$$-4 < x+2 < 4$$

$$-6 < x < 2$$

(ii)  $|3x+1| \geq 2$

$$3x+1 \geq 2 \text{ or } 3x+1 \leq -2$$

$$3x \geq 1 \qquad 3x \leq -3$$

$$x \geq \frac{1}{3} \qquad x \leq -1$$

The solution is  $x \leq -1$  or  $x \geq \frac{1}{3}$ .

(iii)  $|x-2| \leq 1$

$$-1 \leq x-2 \leq 1$$

$$1 \leq x \leq 3$$

(iv)  $|2x-5| > 3$

$$2x-5 > 3 \text{ or } 2x-5 < -3$$

$$2x > 8 \qquad 2x < 2$$

$$x > 4 \qquad x < 1$$

The solution is  $x < 1$  or  $x > 4$ .

4. (i)  $1 < x < 9$

$$1-5 < x-5 < 9-5$$

$$-4 < x-5 < 4$$

$$|x-5| < 4$$

(ii)  $-4 < x < 6$

$$-4-1 < x-1 < 6-1$$

$$-5 < x-1 < 5$$

$$|x-1| < 5$$

(iii)  $-3 < x < 8$

$$-3-2.5 < x-2.5 < 8-2.5$$

$$-5.5 < x-2.5 < 5.5$$

$$|x-2.5| < 5.5$$

(iv)  $2 < x < 11$

$$2-6.5 < x-6.5 < 11-6.5$$

$$-4.5 < x-6.5 < 4.5$$

$$|x-6.5| < 4.5$$