

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise A, Question 1

#### Question:

Solve the following inequality

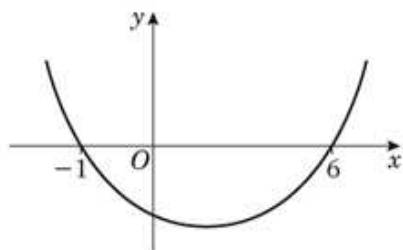
$$x^2 < 5x + 6$$

#### Solution:

$$x^2 - 5x - 6 < 0$$
$$(x - 6)(x + 1) < 0$$

critical values  $x = -1$  or  $6$

sketch



solution is  $-1 < x < 6$

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## Edexcel AS and A Level Modular Mathematics

Exercise A, Question 2

Question:

Solve the following inequality

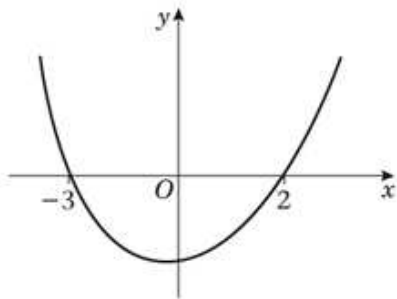
$$x(x + 1) \geq 6$$

Solution:

$$x^2 + x \geq 6$$
$$(x + 3)(x - 2) \geq 0$$

critical values  $x = 2$  or  $-3$

sketch



solution is  $x \geq 2$  or  $x \leq -3$

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## Edexcel AS and A Level Modular Mathematics

### Exercise A, Question 3

Question:

Solve the following inequality

$$\frac{2}{x^2 + 1} > 1$$

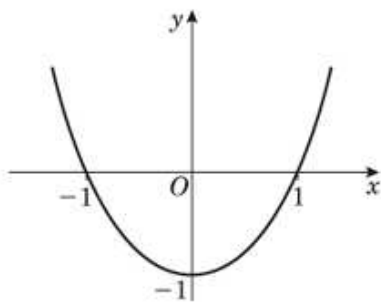
Solution:

$$\begin{aligned} 2 &> x^2 + 1 \\ 0 &> x^2 - 1 \end{aligned}$$

You can multiply by  $x^2 + 1$   
because it is always positive.

critical values  $x = \pm 1$

sketch



solution is  $-1 < x < 1$

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## Edexcel AS and A Level Modular Mathematics

Exercise A, Question 4

Question:

Solve the following inequality

$$\frac{2}{x^2 - 1} > 1$$

Solution:

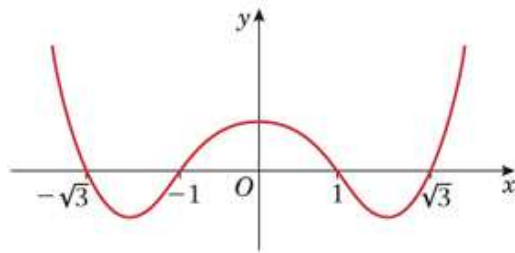
$$\frac{2}{\cancel{x^2 - 1}} \times (x^2 - 1)^2 > (x^2 - 1)^2$$

$$0 > (x^2 - 1)[x^2 - 1 - 2]$$

$$0 > (x - 1)(x + 1)(x - \sqrt{3})(x + \sqrt{3})$$

critical values  $x = \pm 1, \pm\sqrt{3}$

sketch



solution is  $-\sqrt{3} < x < -1$  or  $1 < x < \sqrt{3}$

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# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

Exercise A, Question 5

Question:

Solve the following inequality

$$\frac{x}{x-1} \leq 2x \quad x \neq 1$$

Solution:

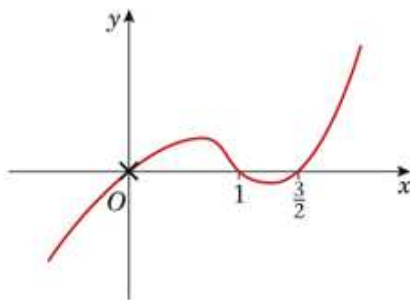
$$\frac{x}{\cancel{(x-1)}} \times (x-1)^2 \leq 2x(x-1)^2$$

$$0 \leq x(x-1)[2x-2-1]$$

$$0 \leq x(x-1)(2x-3)$$

critical values  $x = 0, 1, \frac{3}{2}$

sketch



solution is  $x > \frac{3}{2}$  or  $0 < x < 1$

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## Edexcel AS and A Level Modular Mathematics

Exercise A, Question 6

**Question:**

Solve the following inequality

$$\frac{3}{x+1} < \frac{2}{x}$$

**Solution:**

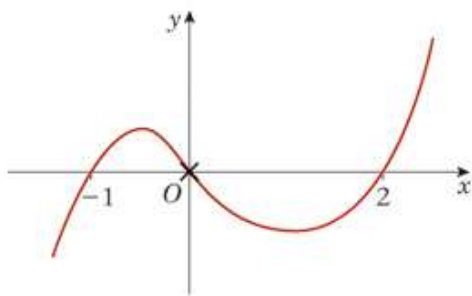
$$\frac{3}{\cancel{(x+1)}} \times (x+1)^2 x^2 < \frac{2}{\cancel{x}} \times (x+1)^2 x^2$$

$$x(x+1)[3x - 2(x+1)] < 0$$

$$x(x+1)(x-2) < 0$$

critical values  $x = 0, -1, 2$

sketch



solution is  $x < -1$  or  $0 < x < 2$

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## Edexcel AS and A Level Modular Mathematics

Exercise A, Question 7

**Question:**

Solve the following inequality

$$\frac{3}{(x+1)(x-1)} < 1$$

**Solution:**

$$\frac{3}{\cancel{(x+1)(x-1)}} \times (x+1)^2(x-1)^2 < (x+1)^2(x-1)^2$$

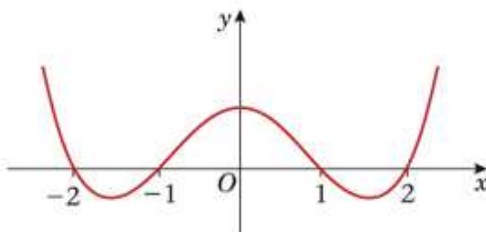
$$0 < (x+1)(x-1)[x^2 - 1 - 3]$$

$$0 < (x+1)(x-1)(x-2)(x+2)$$

critical values

$$x = \pm 1, \pm 2$$

sketch



solution is  $x < -2$  or  $-1 < x < 1$  or  $x > 2$

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## Edexcel AS and A Level Modular Mathematics

### Exercise A, Question 8

#### Question:

Solve the following inequality

$$\frac{2}{x^2} \geq \frac{3}{(x+1)(x-2)}$$

#### Solution:

$$\frac{2}{x^2} \times (x+1)^2(x-2)^2 \geq \frac{3(x+1)^2(x-2)^2}{(x+1)(x-2)}$$

$$(x+1)(x-2)[2x^2 - 2x - 4 - 3x^2] \geq 0$$

You can multiply across  $x^2$  since it is positive.

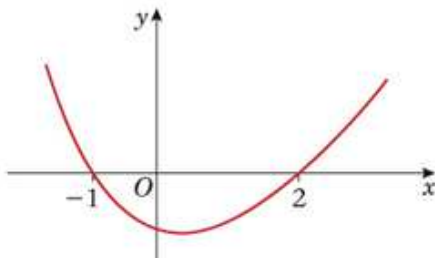
$$(x+1)(x-2)(-4 - 2x - x^2) \geq 0$$

or  $0 \geq (x+1)(x-2)(x^2 + 2x + 4)$

$x^2 + 2x + 4$  has no real roots

$\therefore$  critical values  $x = 2$  or  $-1$

sketch



solution is  $-1 < x < 2$   $x \neq 0$

or  $-1 < x < 0$  or  $0 < x < 2$

NB  $x = 2$  and  $x = -1$ ,  $x = 0$  are invalid in the original expression.



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## Edexcel AS and A Level Modular Mathematics

Exercise A, Question 9

Question:

Solve the following inequality

$$\frac{2}{x-4} < 3$$

Solution:

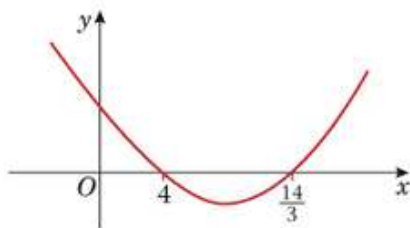
$$\frac{2}{x-4} \times (x-4)^2 < 3(x-4)^2$$

$$0 < (x-4)[3x-12-2]$$

$$0 < (x-4)(3x-14)$$

critical values  $x = 4, \frac{14}{3}$

sketch



solution is  $x < 4$  or  $x > \frac{14}{3}$

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## Edexcel AS and A Level Modular Mathematics

Exercise A, Question 10

Question:

Solve the following inequality

$$\frac{3}{x+2} > \frac{1}{x-5}$$

Solution:

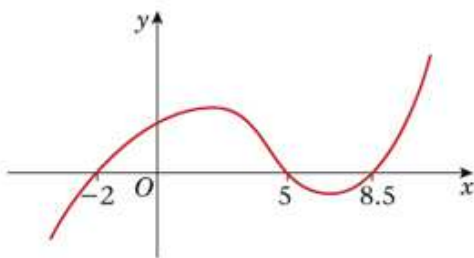
$$\frac{3}{\cancel{(x+2)}} \times (x+2)^2(x-5)^2 > \frac{1}{\cancel{(x-5)}} \times (x+2)^2(x-5)^2$$

$$(x+2)(x-5)[3x-15-(x+2)] > 0$$

$$(x+2)(x-5)(2x-17) > 0$$

critical values  $x = -2, 5, 8.5$

sketch



solution is  $-2 < x < 5$  or  $x > 8.5$

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# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise A, Question 11

#### Question:

Solve the following inequality

$$\frac{3x^2 + 5}{x + 5} > 1$$

#### Solution:

$$\frac{3x^2 + 5}{(x + 5)} \times (x + 5)^2 > (x + 5)^2$$

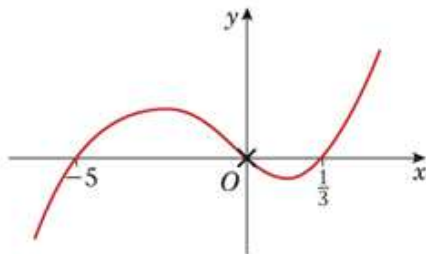
$$(x + 5)[3x^2 + 5 - (x + 5)] > 0$$

$$(x + 5)(3x^2 - x) > 0$$

$$(x + 5)x(3x - 1) > 0$$

critical values  $x = 0, \frac{1}{3}, -5$

sketch



solution is  $-5 < x < 0$  or  $x > \frac{1}{3}$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

Exercise A, Question 12

Question:

Solve the following inequality

$$\frac{3x}{x-2} > x$$

Solution:

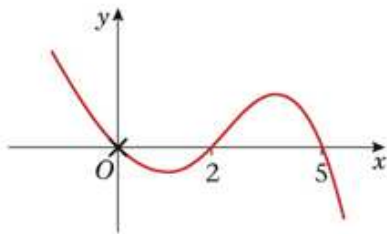
$$\frac{3x}{\cancel{x-2}} \times (x-2)^2 > x(x-2)^2$$

$$x(x-2)[3-(x-2)] > 0$$

$$x(x-2)(5-x) > 0$$

critical values  $x = 0, 2, 5$

sketch



Note this is a  $-x^3$  curve.

solution is  $x < 0$  or  $2 < x < 5$

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## Edexcel AS and A Level Modular Mathematics

Exercise A, Question 13

Question:

Solve the following inequality

$$\frac{1+x}{1-x} > \frac{2-x}{2+x}$$

Solution:

$$\frac{1+x}{1-x} \times (1-x)^2(2+x)^2 > \frac{2-x}{2+x} \times (1-x)^2(2+x)^2$$

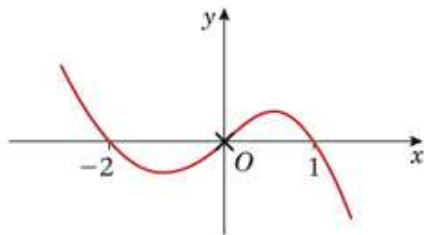
$$(1-x)(2+x)[(1+x)(2+x) - (2-x)(1-x)] > 0$$

$$(1-x)(2+x)(x^2 + 3x + 2 - (x^2 - 3x + 2)) > 0$$

$$(1-x)(2+x)6x > 0$$

critical values  $x = 1, -2, 0$

sketch



Curve is  $y = -x^3$   
shape.

solution is  $x < -2$  or  $0 < x < 1$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise A, Question 14

#### Question:

Solve the following inequality

$$\frac{x^2 + 7x + 10}{x + 1} > 2x + 7$$

#### Solution:

$$\frac{x^2 + 7x + 10}{\cancel{x+1}} \times (x+1)^2 > (2x+7) \times (x+1)^2$$

$$(x+1)[x^2 + 7x + 10 - (2x+7)(x+1)] > 0$$

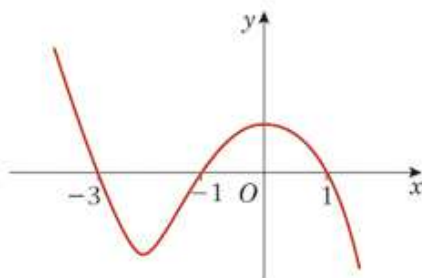
$$(x+1)[x^2 + 7x + 10 - 2x^2 - 9x - 7] > 0$$

$$(x+1)(3 - 2x - x^2) > 0$$

$$(x+1)(1-x)(x+3) > 0$$

critical values  $x = -1, 1, -3$

sketch



This is  $y = -x^3$  shape.

solution is  $x < -3$  or  $-1 < x < 1$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

Exercise A, Question 15

**Question:**

Solve the following inequalities

**a**  $\frac{x+1}{x^2} > 6$

**b**  $\frac{x^2}{x+1} > \frac{1}{6}$

**Solution:**

**a**  $\frac{x+1}{x^2} > 6$

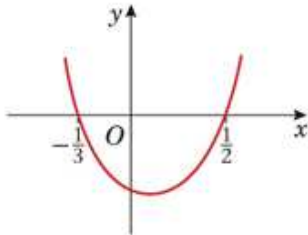
$$0 > 6x^2 - x - 1$$

$$0 > (3x+1)(2x-1)$$

You can multiply by  $x^2$   
since it is  $> 0$ .

critical values  $x = -\frac{1}{3}, \frac{1}{2}$

sketch



solution is  $-\frac{1}{3} < x < \frac{1}{2}$  But  $x \neq 0$

or  $-\frac{1}{3} < x < 0$  or  $0 < x < \frac{1}{2}$

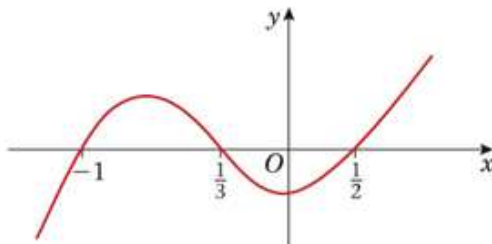
**b**  $\frac{x^2}{x+1} \times (x+1)^2 > \frac{1}{6}(x+1)^2$

$$(x+1)[6x^2 - (x+1)] > 0$$

$$(x+1)(3x+1)(2x-1) > 0$$

critical values  $x = -1, \frac{1}{2}, -\frac{1}{3}$

sketch



solution is  $-1 < x < -\frac{1}{3}$  or  $x > \frac{1}{2}$



# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise B, Question 1

#### Question:

Solve the following inequality

$$|x - 6| > 6x$$

#### Solution:

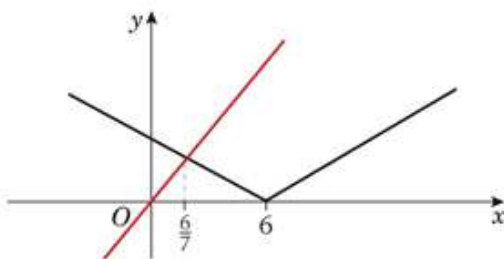
$$|x - 6| > 6x$$

$$x - 6 = 6x \quad \text{or} \quad -(x - 6) = 6x$$

$$\Rightarrow -6 = 5x \quad \Rightarrow \quad 6 = 7x$$

$$-1.2 = x \quad \Rightarrow \quad \frac{6}{7} = x$$

sketch



only  $x = \frac{6}{7}$  is valid

solution is  $x < \frac{6}{7}$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise B, Question 2

#### Question:

Solve the following inequality

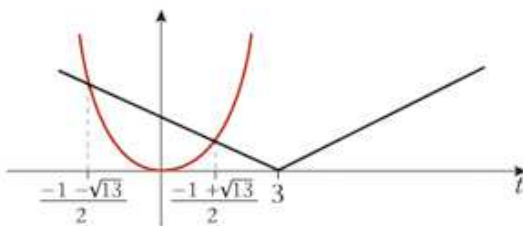
$$|t - 3| > t^2$$

#### Solution:

$$|t - 3| > t^2$$

$$\begin{array}{ll} t - 3 = t^2 & \text{or} \quad -(t - 3) = t^2 \\ \Rightarrow 0 = t^2 - t + 3 & \Rightarrow 0 = t^2 + t - 3 \\ t = \text{no solution} & t = \frac{-1 \pm \sqrt{1 + 12}}{2} \end{array}$$

sketch



$$|t - 3| \text{ is above } t^2 \text{ for } \frac{-1 - \sqrt{13}}{2} < t < \frac{-1 + \sqrt{13}}{2}$$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise B, Question 3

#### Question:

Solve the following inequality

$$|(x - 2)(x + 6)| < 9$$

#### Solution:

$$|(x - 2)(x + 6)| < 9$$

$$x^2 + 4x - 12 = 9$$

$$\text{or} \quad -(x^2 + 4x - 12) = 9$$

$$\Rightarrow x^2 + 4x - 21 = 0$$

$$0 = x^2 + 4x - 3$$

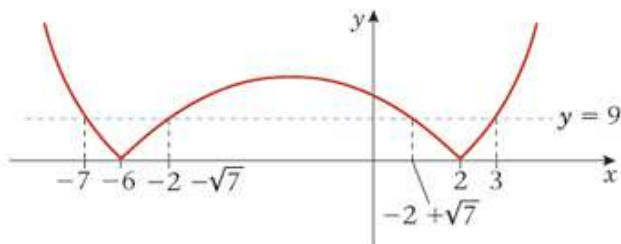
$$(x - 3)(x + 7) = 0$$

$$x = \frac{-4 \pm \sqrt{16 + 12}}{2}$$

$$x = 3 \text{ or } -7$$

$$x = -2 \pm \sqrt{7}$$

sketch



Line  $y = 9$  is above curve for  $-7 < x < -2 - \sqrt{7}$  or  $-2 + \sqrt{7} < x < 3$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise B, Question 4

Question:

Solve the following inequality

$$|2x + 1| \geq 3$$

Solution:

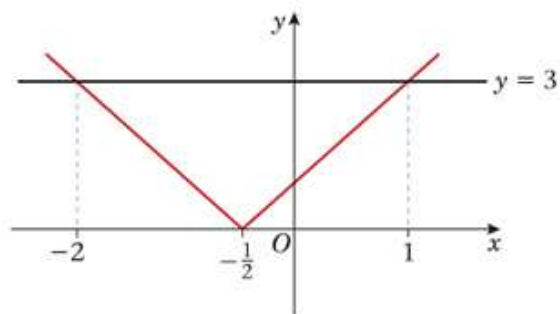
$$|2x + 1| \geq 3$$

$$2x + 1 = 3 \quad \text{or} \quad -(2x + 1) = 3$$

$$\Rightarrow \quad 2x = 2 \quad \quad \quad -4 = 2x$$

$$x = 1 \quad \quad \quad -2 = x$$

sketch



solution is  $y = 3$  is below the  $\vee$  when

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

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise B, Question 5

#### Question:

Solve the following inequality

$$|2x| + x > 3$$

#### Solution:

$$|2x| + x > 3$$

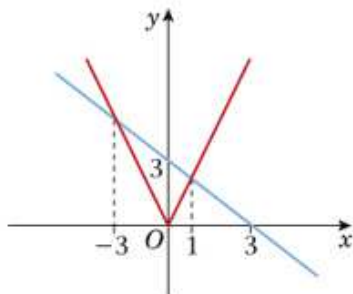
$$\text{Rearrange: } |2x| > 3 - x$$

$$2x = 3 - x \quad \text{or} \quad -2x = 3 - x$$

$$\Rightarrow 3x = 3 \quad \quad \quad -x = 3$$

$$\Rightarrow x = 1 \quad \quad \quad \text{or} \quad x = -3$$

sketch



$y = 3 - x$  is below  $\vee$  for

$$x < -3 \text{ or } x > 1$$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise B, Question 6

#### Question:

Solve the following inequality

$$\frac{x+3}{|x|+1} < 2$$

#### Solution:

$$\frac{x+3}{|x|+1} < 2$$

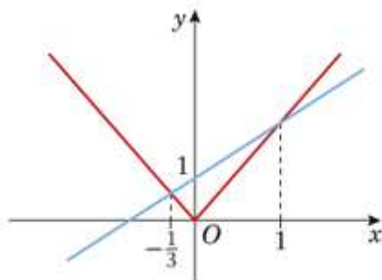
Rearrange:  $x+3 < 2|x|+2$

i.e.  $x+1 < 2|x|$

Because  $|x|+1$  is positive you can multiply across.

$$\begin{array}{l} x+1 = 2x \quad \text{or} \quad x+1 = -2x \\ \Rightarrow 1 = x \quad \Rightarrow \quad 3x = -1 \\ \quad \quad \quad \quad \quad \quad \quad \quad x = -\frac{1}{3} \end{array}$$

sketch



Line  $y = x + 1$  is below  $\vee$  when  $x < -\frac{1}{3}$  or  $x > 1$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise B, Question 7

#### Question:

Solve the following inequality

$$\frac{3-x}{|x|+1} > 2$$

#### Solution:

$$\frac{3-x}{|x|+1} > 2$$

Rearrange:  $3-x > 2|x|+2$

$$1-x > 2|x|$$

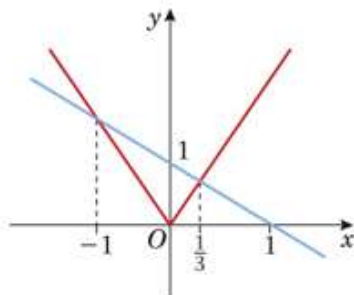
You can multiply by  $|x|+1$  since it is  $> 0$ .

$$1-x = 2x \quad \text{or} \quad 1-x = -2x$$

$$\Rightarrow \quad 1 = 3x \quad \quad \quad x = -1$$

$$\frac{1}{3} = x$$

sketch



The line  $y = 1 - x$  is above the  $\vee$  for  $-1 < x < \frac{1}{3}$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise B, Question 8

#### Question:

Solve the following inequality

$$\left| \frac{x}{x+2} \right| < 1 - x$$

#### Solution:

$$\left| \frac{x}{x+2} \right| < 1 - x$$

$$\frac{x}{x+2} = 1 - x$$

$$\text{or} \quad -\frac{x}{x+2} = 1 - x$$

$$\Rightarrow \quad x = (1 - x)(x + 2)$$

$$-x = (1 - x)(x + 2)$$

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

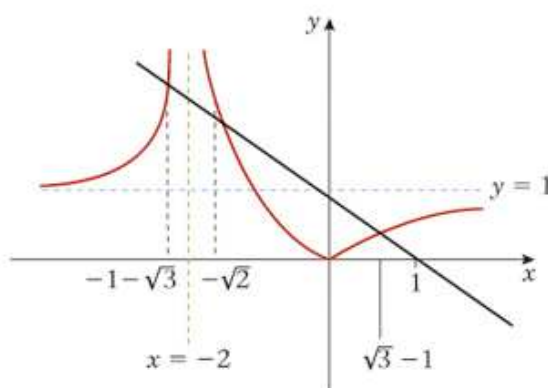
$$x^2 - 2 = 0$$

$$x = \frac{-2 \pm \sqrt{12}}{2}$$

$$x = \pm\sqrt{2}$$

$$x = -1 \pm \sqrt{3}$$

sketch



NB  $x = +\sqrt{2}$  is invalid.

The line  $y = 1 - x$  is above the curve for  $x < -1 - \sqrt{3}$

$$\text{or } -\sqrt{2} < x < -1 + \sqrt{3}$$



# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise B, Question 9

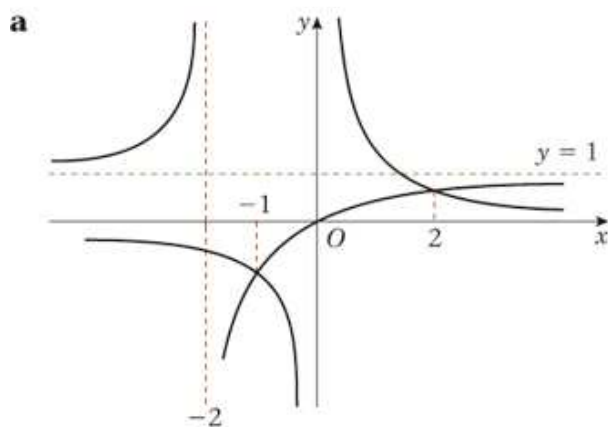
Question:

Solve the following inequalities

**a** On the same axes sketch the graphs of  $y = \frac{1}{x}$  and  $y = \frac{x}{x+2}$ .

**b** Solve  $\frac{1}{x} > \frac{x}{x+2}$ .

Solution:



**b**  $\frac{1}{x} = \frac{x}{x+2} \Rightarrow x+2 = x^2$   
 i.e.  $0 = x^2 - x - 2$   
 $0 = (x-2)(x+1)$   
 $x = 2$  or  $-1$

$\frac{1}{x}$  is above  $\frac{x}{x+2}$  for  $-2 < x < -1$  or  $0 < x < 2$

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## Edexcel AS and A Level Modular Mathematics

### Exercise B, Question 10

#### Question:

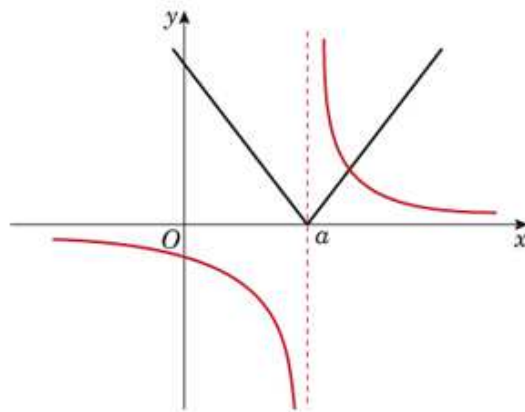
Solve the following inequalities

**a** On the same axes sketch the graphs of  $y = \frac{1}{x-a}$  and  $y = 4|x-a|$ .

**b** Solve, giving your answers in terms of the constant  $a$ ,  $\frac{1}{x-a} < 4|x-a|$ .

#### Solution:

**a**  
(Assume  $a > 0$ )



**b**  $\frac{1}{x-a} = 4(x-a)$

$$\frac{1}{4} = (x-a)^2$$

$$\pm \frac{1}{2} = x-a$$

$$x = a \pm \frac{1}{2}$$

Only this case needs to be considered because the right hand branch of V has the intersection.

From sketch  $x = a + \frac{1}{2}$ .

V is above when  $x < a$  or  $x > a + \frac{1}{2}$

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## Edexcel AS and A Level Modular Mathematics

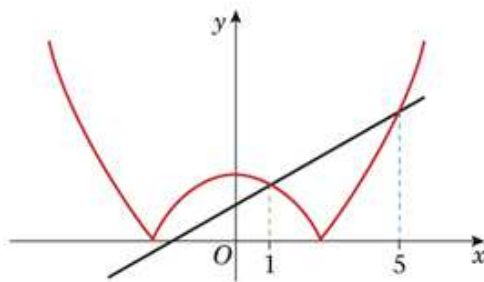
### Exercise C, Question 1

#### Question:

Solve the inequality  $|x^2 - 7| < 3(x + 1)$

#### Solution:

sketch:



$$|x^2 - 7| < 3(x + 1)$$

$$x^2 - 7 = 3x + 3 \quad \text{or} \quad -(x^2 - 7) = 3x + 3$$

$$\Rightarrow x^2 - 3x - 10 = 0 \quad \Rightarrow \quad 0 = x^2 + 3x - 4$$

$$(x - 5)(x + 2) = 0 \quad 0 = (x + 4)(x - 1)$$

$$x = -2 \text{ or } 5 \quad x = -4 \text{ or } 1$$

From the sketch, only  $x = 1$  and  $x = 5$  are valid.

Line is above the curve for  $1 < x < 5$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise C, Question 2

Question:

Solve the inequality  $\frac{x^2}{|x| + 6} < 1$

Solution:

$$\frac{x^2}{|x| + 6} < 1$$

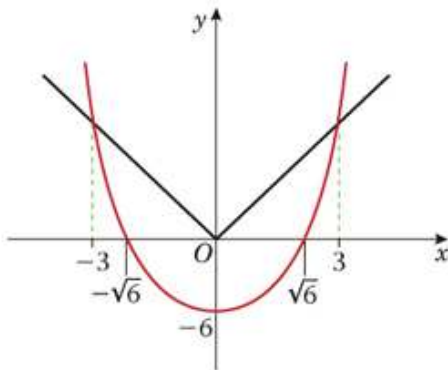
Rearrange:

$$x^2 < |x| + 6$$

$$\text{or } x^2 - 6 < |x|$$

Multiply by  $|x| + 6$   
since it is positive.

sketch:



$$x^2 - 6 = x$$

or

$$x^2 - 6 = -x$$

$$\Rightarrow x^2 - x - 6 = 0$$

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

$$(x - 3)(x + 2) = 0$$

$$(x + 3)(x - 2) = 0$$

$$x = -2 \text{ or } 3$$

$$x = 2 \text{ or } -3$$

From the sketch the intersections are  $> \sqrt{6}$   $\therefore x = \pm 3$

Curve is below  $\vee$  for  $-3 < x < 3$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise C, Question 3

#### Question:

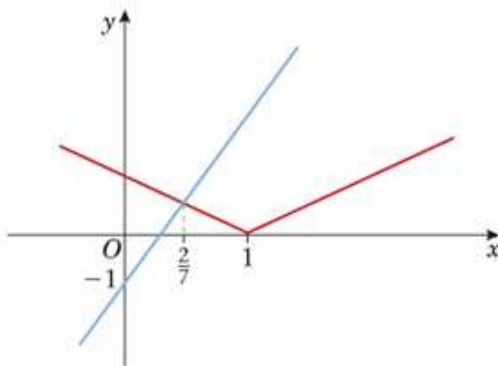
Find the set of values of  $x$  for which  $|x - 1| > 6x - 1$

#### Solution:

$$|x - 1| > 6x - 1$$

$$\begin{array}{lll} x - 1 = 6x - 1 & \text{or} & -(x - 1) = 6x - 1 \\ \Rightarrow 0 = 5x & & 2 = 7x \\ \Rightarrow x = 0 & & \frac{2}{7} = x \end{array}$$

sketch:



$x = 0$  is not valid so only critical value is  $x = \frac{2}{7}$

$\forall$  is above the line for  $x < \frac{2}{7}$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise C, Question 4

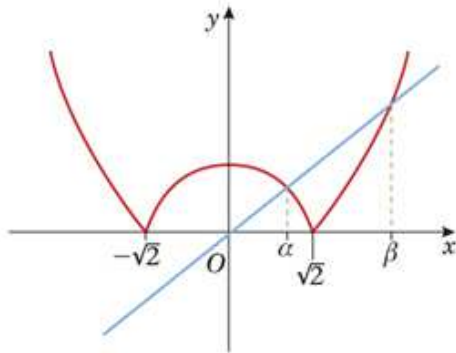
#### Question:

Find the complete set of values of  $x$  for which  $|x^2 - 2| > 2x$

#### Solution:

$$|x^2 - 2| > 2x$$

sketch:



$$x^2 - 2 = 2x$$

$$\Rightarrow x^2 - 2x - 2 = 0$$

$$x = \frac{2 \pm \sqrt{12}}{2}$$

$$x = 1 \pm \sqrt{3}$$

$$\text{or } -(x^2 - 2) = 2x$$

$$\Rightarrow 0 = x^2 + 2x - 2$$

$$x = \frac{-2 \pm \sqrt{12}}{2}$$

$$x = -1 \pm \sqrt{3}$$

$\beta$  is a solution of this equation  
so must be  $1 + \sqrt{3}$

$\alpha$  is a solution of this equation  
so must be  $\sqrt{3} - 1$

The line is below the curve for  $x > 1 + \sqrt{3}$  or  $x < \sqrt{3} - 1$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

Exercise C, Question 5

Question:

Find the set of values of  $x$  for which  $\frac{x+1}{2x-3} < \frac{1}{x-3}$

Solution:

$$\frac{x+1}{\cancel{2x-3}} \times (2x-3)^2(x-3)^2 < \frac{1}{\cancel{x-3}} \times (2x-3)^2(x-3)^2$$

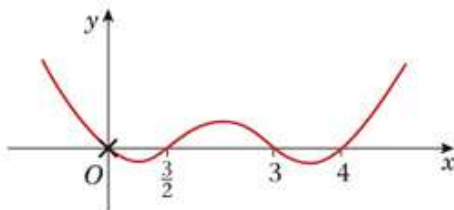
$$(2x-3)(x-3)[(x+1)(x-3) - (2x-3)] < 0$$

$$(2x-3)(x-3)(x^2 - 2x - 3 - 2x + 3) < 0$$

$$(2x-3)(x-3)x(x-4) < 0$$

critical values  $x = \frac{3}{2}, 3, 4, 0$

sketch



$$0 < x < \frac{3}{2} \text{ or } 3 < x < 4$$

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# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

### Exercise C, Question 6

Question:

Solve  $\frac{(x+3)(x+9)}{x-1} > 3x-5$

Solution:

$$\frac{(x+3)(x+9)}{\cancel{x-1}} \times (x-1)^2 > (3x-5) \times (x-1)^2$$

$$(x-1)[x^2 + 12x + 27 - (3x^2 - 8x + 5)] > 0$$

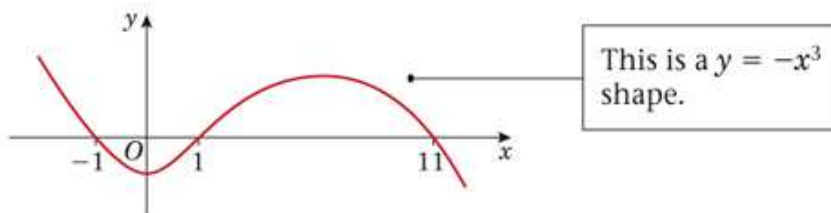
$$(x-1)(22 + 20x - 2x^2) > 0$$

$$(x-1)(11 + 10x - x^2) > 0 \quad \leftarrow \text{Divide by 2.}$$

$$(x-1)(11-x)(1+x) > 0$$

critical values  $x = 1, -1, 11$

sketch:



$$x < -1 \text{ or } 1 < x < 11$$



# Solutionbank FP2

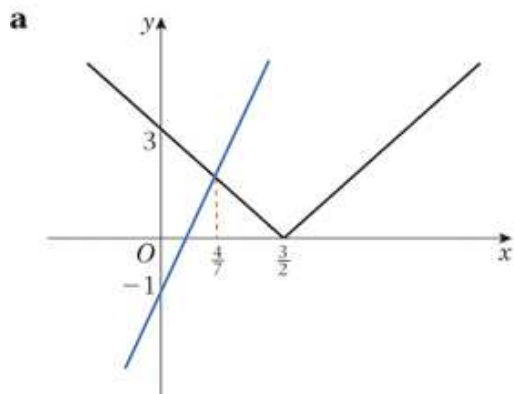
## Edexcel AS and A Level Modular Mathematics

### Exercise C, Question 7

#### Question:

- a** Sketch, on the same axes, the graph with equation  $y = |2x - 3|$ , and the line with equation  $y = 5x - 1$
- b** Solve the inequality  $|2x - 3| < 5x - 1$

#### Solution:



**b**  $|2x - 3| < 5x - 1$

$$2x - 3 = 5x - 1 \quad \text{or} \quad -(2x - 3) = 5x - 1$$

$$\Rightarrow \quad -2 = 3x \qquad \qquad \qquad 4 = 7x$$

$$\qquad \qquad -\frac{2}{3} = x \qquad \qquad \qquad \frac{4}{7} = x$$

From sketch this is not valid.

Line is above  $\mathbf{V}$  for  $x > \frac{4}{7}$

# Solutionbank FP2

## Edexcel AS and A Level Modular Mathematics

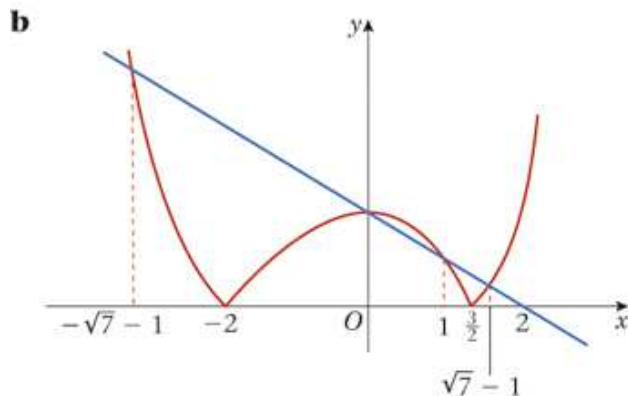
### Exercise C, Question 8

#### Question:

- a** Use algebra to find the exact solution of  $|2x^2 + x - 6| = 6 - 3x$
- b** On the same diagram, sketch the curve with equation  $y = |2x^2 + x - 6|$  and the line with equation  $y = 6 - 3x$
- c** Find the set of values of  $x$  for which  $|2x^2 + x - 6| > 6 - 3x$

#### Solution:

$$\begin{aligned} \mathbf{a} \quad 2x^2 + x - 6 &= 6 - 3x & \text{or} & \quad -(2x^2 + x - 6) = 6 - 3x \\ 2x^2 + 4x - 12 &= 0 & & \quad 0 = 2x^2 - 2x \\ 2(x^2 + 2x - 6) &= 0 & & \quad 0 = 2x(x - 1) \\ x &= \frac{-2 \pm \sqrt{28}}{2} & & \quad x = 0 \text{ or } 1 \\ &= -1 \pm \sqrt{7} \end{aligned}$$



$$\begin{aligned} 2x^2 + x - 6 &= 0 \\ (2x - 3)(x + 2) &= 0 \\ x &= -2 \text{ or } \frac{3}{2} \end{aligned}$$

- c** The line is below the curve for  $x > \sqrt{7} - 1$  or  $0 < x < 1$  or  $x < -\sqrt{7} - 1$

# Solutionbank FP2

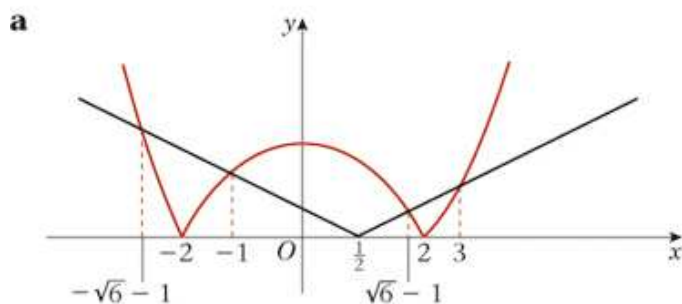
## Edexcel AS and A Level Modular Mathematics

### Exercise C, Question 9

#### Question:

- a** On the same diagram, sketch the graphs of  $y = |x^2 - 4|$  and  $y = |2x - 1|$ , showing the coordinates of the points where the graphs meet the  $x$ -axis.
- b** Solve  $|x^2 - 4| = |2x - 1|$ , giving your answers in surd form where appropriate.
- c** Hence, or otherwise, find the set of values of  $x$  for which  $|x^2 - 4| > |2x - 1|$

#### Solution:



**b**

$$x^2 - 4 = 2x - 1 \quad \text{or} \quad x^2 - 4 = -(2x - 1)$$

$$\Rightarrow x^2 - 2x - 3 = 0 \quad \Rightarrow \quad x^2 + 2x - 5 = 0$$

$$(x - 3)(x + 1) = 0 \quad x = \frac{-2 \pm \sqrt{24}}{2}$$

$$x = -1 \text{ or } 3 \quad x = -1 \pm \sqrt{6}$$

- c**  $\nabla$  is below the curve for

$$|x^2 - 4| > |2x - 1|$$

when  $x > 3$  or  $-1 < x < \sqrt{6} - 1$  or  $x < -\sqrt{6} - 1$