

# Inequalities

## 1 Solving inequalities

We can build upon our previous algebraic skills in order to solve more complex inequalities

Remember:

- Don't multiply anything that could be negative - use "squared" things
- Find the critical values ( $f(x)=0$ )
- Sketch the graph to solve

### 1.1 Examples

#### 1.1.1 Example 1

$$2x^2 < x + 3$$

Move all terms to one side

$$2x^2 - x - 3 < 0$$

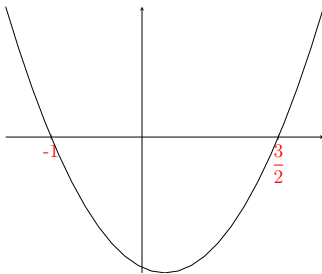
Factorise

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

Solve to find critical values

$$\text{CVs: } x = \frac{3}{2}, -1$$

Draw graph to find inequality



Write inequality for when the graph is below the x axis

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

**1.1.2 Example 2**

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

Multiply both sides by  $(x+1)^2(x+3)^2$

$$x(x+1)(x+3)^2 < 2(x+3)(x+1)^2$$

Put all terms on one side

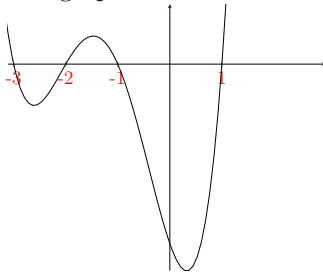
$$x(x+1)(x+3)^2 - 2(x+3)(x+1)^2 < 0$$

Simplify

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

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

Plot graph



Write the inequality for when the graph is below the x axis

$$-3 < x < -2, \quad -1 < x < 1$$