

# Dr Oliver Mathematics

## Worked Examples

### Quadratic Inequality 3

**From:** Edexcel GCSE Mathematics 2022 Paper 2H (Calculator)

1. Find algebraically the set of values of  $x$  for which

(5)

$$x^2 - 49 > 0 \text{ and } 5x^2 - 31x - 72 > 0.$$

#### Solution

$$\underline{x^2 - 49 > 0:}$$

Difference of two squares:

$$\begin{aligned} x^2 - 49 > 0 &\Rightarrow (x)^2 - 7^2 > 0 \\ &\Rightarrow (x - 7)(x + 7) > 0 \end{aligned}$$

|                  | $x < -7$ | $x = -7$ | $-7 < x < 7$ | $x = 7$ | $x > 7$ |
|------------------|----------|----------|--------------|---------|---------|
| $x + 7$          | −        | 0        | +            | +       | +       |
| $x - 7$          | −        | −        | −            | 0       | +       |
| $(x + 7)(x - 7)$ | +        | 0        | −            | 0       | +       |

$$\Rightarrow \boxed{x < -7 \text{ or } x > 7.}$$

$$\underline{5x^2 - 31x - 72 > 0:}$$

$$\left. \begin{array}{l} \text{add to:} \\ \text{multiply to:} \end{array} \right\} \begin{array}{l} -31 \\ (+5) \times (-72) = -360 \end{array} + 9, -40$$

and

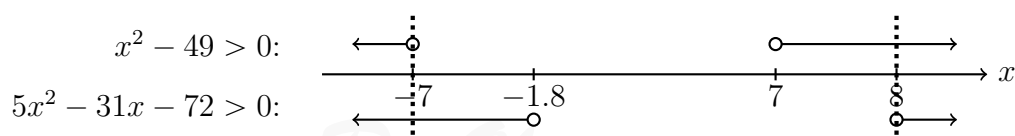
$$\begin{aligned} 5x^2 - 31x - 72 > 0 &\Rightarrow 5x^2 + 9x - 40x - 72 > 0 \\ &\Rightarrow x(5x + 9) - 8(5x + 18) > 0 \\ &\Rightarrow (x - 8)(5x + 9) > 0 \end{aligned}$$

|                   | $x < -1.8$ | $x = -1.8$ | $-1.8 < x < 8$ | $x = 8$ | $x > 8$ |
|-------------------|------------|------------|----------------|---------|---------|
| $5x + 9$          | -          | 0          | +              | +       | +       |
| $x - 8$           | -          | -          | -              | 0       | +       |
| $(5x + 9)(x - 8)$ | +          | 0          | -              | 0       | +       |

Hence,

$$5x^2 - 31x - 72 > 0 \Rightarrow \boxed{x < -1.8 \text{ or } x > 8.}$$

Now, draw a number line:



Finally, the solution set is

$$\underline{\underline{x < -7 \text{ or } x > 8.}}$$