

(12) Solving Modulus Equations and Inequalities

WORKING AT D/E

(1) $f(x) = |x|, x \in R$

(a) Sketch the graph of $y = f(x)$

(b) Write down the range of $f(x)$

Using your answers to parts (a) and (b),

(c) Sketch the graph of $y = |x| + 3$

(d) State the range of $y = |x| + 3$

Given that $g(x) = -|x| + 3, x \in R$

(e) Find the range of $g(x)$

(f) Solve the equation $g(x) = -5$

(2) (a) Solve the equation $|2x + 6| = x + 4$

(b) Hence, solve $|2x + 6| \leq x + 4$

(3) By drawing two different graphs, show that there are no solutions to the equation $1 - |x| = 6$

WORKING AT B/C

(1) (a) Solve $|3x + 7| = |x - 3|$

(b) Hence, solve $|3x + 7| < |x - 3|$

(2) $f(x) = |3x| - 5$

(a) Sketch the graph of $y = f(x)$ showing where the graph crosses the coordinate axes.

(b) Solve the inequality $f(x) > 6$ giving your answers as exact fractions.

(c) Explain why $f^{-1}(x)$ doesn't exist.

(d) With the help of a sketch, show that there are no solutions to the equation $f(x) = x - 6$

(3) Sketch the graph of $y = 5 - |x + 1|$ show where the graph crosses the coordinate axes.

WORKING AT A*/A

(1) $f(x) = |ax - 2|, x \in R$ where a is a positive constant.

(a) Sketch the graph of $y = f(x)$ showing where the graph meets or crosses the coordinate axes. Give the coordinates in terms of a

(b) Solve $|ax - 2| \geq a$ giving your answers in terms of a

Given that there is one solution to the equation $|ax - 2| = b - x$ where b is a constant

(c) Find b in terms of a .

(2) $f(x) = |x + a| + b, x \in R$ where a and b are constants.

The graph of $y = |x + a| + b$ has a minimum point with coordinates $(-1, 4)$ and y intercept $(0, 5)$.

(a) Find the values of a and b

(b) Hence solve $|x + a| + b < 3 - 0.5x$

(c) The equation $f(x) + c = 7$ where c is a constant has one solution. Find the value of c .

(3) There are no solutions to the equation $3|\cos(x)| + 1 = a, 0 < x < 360$, where a is a constant. Find the possible set of values of a .