C3 FUNCTIONS Worksheet D

1 $\mathrm{f} : x \rightarrow |x - 4|,\ x \in \mathbb{R}$ $\mathrm{g} : x \rightarrow |x| - 4,\ x \in \mathbb{R}$

Find the value of

a f(6) **b** f(3) **c** f(–2) **d** g(2) **e** g(–8) **f** g(–1)

2 $\mathrm{f} : x \rightarrow x^2 + 2x - 3,\ x \in \mathbb{R}$ $\mathrm{g} : x \rightarrow |2x + 1|,\ x \in \mathbb{R}$

Find the value of

a gf(0) **b** fg(0) **c** fg(4) **d** gg(–3) **e** gf(–3) **f** fg(–1)

3 Sketch each of the following graphs, showing the coordinates of any points of intersection with the axes. Where it occurs, a is a positive constant.

a $y = |x + 4|$ **b** $y = |2x - 5|$ **c** $y = |2 - 3x|$

d $y = |x^2 - 9|$ **e** $y = |x^3|$ **f** $y = |\sin x|,\ 0 \le x \le 2\pi$

g $y = |x - a|$ **h** $y = |3x + a|$ **i** $y = |a - 2x|$

j $y = |16 - x^2|$ **k** $y = |(x + 3)(2x - 1)|$ **l** $y = \left|\frac{1}{x}\right|,\ x \ne 0$

m $y = |\ln x|,\ x > 0$ **n** $y = |10 - 3x - x^2|$ **o** $y = |3x^2 + 5ax - 2a^2|$

4 For each of the following,

i sketch $y = \mathrm{f}(x)$ and $y = \mathrm{g}(x)$ on the same diagram,

ii solve the equation $\mathrm{f}(x) = \mathrm{g}(x)$.

The domain of all the functions is $x \in \mathbb{R}$ and a is a positive constant where it occurs.

a $\mathrm{f}(x) \equiv |2x - 3|,\ \mathrm{g}(x) \equiv 2$ **b** $\mathrm{f}(x) \equiv |7 - 3x|,\ \mathrm{g}(x) \equiv 7$

c $\mathrm{f}(x) \equiv |4x + 3a|,\ \mathrm{g}(x) \equiv 5a$ **d** $\mathrm{f}(x) \equiv |x^2 - 4|,\ \mathrm{g}(x) \equiv 9$

e $\mathrm{f}(x) \equiv |x^2 - 4x - 12|,\ \mathrm{g}(x) \equiv 20$ **f** $\mathrm{f}(x) \equiv |2a - 5x|,\ \mathrm{g}(x) \equiv x$

5 Solve each equation.

a $|x - 5| = 3$ **b** $|x + 1| = 15$ **c** $|2x - 7| = 4$

d $|x - 2| = |x + 4|$ **e** $|x - 5| = |7 - x|$ **f** $|2x + 1| = |9 - 2x|$

g $|x + 3| = |2x|$ **h** $|4x - 1| = |2 - x|$ **i** $|3x - 4| = |2x + 3|$

6 Find the set of values of x for which

a $|x - 20| < 2$ **b** $|2x - 11| \le 5$ **c** $|x - 17| > 12$

d $|5x - 22| < 40$ **e** $|x + 4| \le |x + 1|$ **f** $|x + 2| > |2x - 5|$

7 For each of the following, sketch $y = |\mathrm{f}(x)|$ and $y = \mathrm{f}(|x|)$ on separate diagrams showing the coordinates of any points of intersection with the axes.

a $\mathrm{f} : x \rightarrow 3x - 1,\ x \in \mathbb{R}$ **b** $\mathrm{f} : x \rightarrow 3 - 4x,\ x \in \mathbb{R}$

c $\mathrm{f} : x \rightarrow 4x^2 - 25,\ x \in \mathbb{R}$ **d** $\mathrm{f} : x \rightarrow (1 + x)(5 - x),\ x \in \mathbb{R}$

e $\mathrm{f} : x \rightarrow \tan x,\ x \in \mathbb{R},\ -\frac{\pi}{2} < x < \frac{\pi}{2}$ **f** $\mathrm{f} : x \rightarrow \mathrm{e}^x,\ x \in \mathbb{R}$