C3 FUNCTIONS *Worksheet D*

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

Find the value of

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

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

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** $y=\left|\frac{1}{x}\right|,\ x \neq 0$

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 $y=f(x)$ and $y=g(x)$ on the same diagram,

ii solve the equation $f(x)=g(x)$.

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

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

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

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

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 $y=|f(x)|$ and $y=f(|x|)$ on separate diagrams showing the coordinates of any points of intersection with the axes.

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

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

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