C3 FUNCTIONS — Worksheet D

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

Find the value of

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

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

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** $f: x \to e^x,\ x \in \mathbb{R}$