



Functions

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1	20	(a) 27 (b) $9x^2$ cao (c) $\sqrt[3]{x+1}$	2 2 2	M1 $g(-1) = 4$ seen or $((x-1)^2 - 1)^3$ M1 $(3x+1-1)^2$ or better M1 interchange x, y & rearrange formula
2	18	(a) 64 (b) 9	2 2	B1 for evidence of $f(-2) = 6$ M1 for $3x - 5 = 22$ or $\frac{x+5}{3}$ seen
3	25	(a) -3 (b) $\frac{1}{2x-7}$ (c) $\frac{x+7}{2}$	2 1 2	B1 $g(\frac{1}{2}) = 2$ or $fg(x) = \frac{2}{x} - 7$ oe M1 for $y+7 = 2x$ or $x = 2y-7$
4	20	(a) (i) 9 (ii) $8x^3$ cao (b) 4 www (c) $\frac{x+3}{2}$	1 1 3 2	M1 for $(2x-3)^3 = 125$ M1 $2x-3 = 5$ M1 for $x \pm 3 = 2y$ or $x = \frac{y \pm 3}{2}$
5	19	(a) 8 (b) $4x-9$ (c) $2^{2(x+1)}$ or 2^{2x+2} or 4^{x+1}	1 2 2	M1 $2(2x-3) - 3$ seen M1 $(2^{x+1})^2$ seen
6	17	(a) $\frac{1}{2}$ (b) $\sqrt[3]{(x-1)}$ or $\sqrt[3]{x-1}$ (c) 1 2	2 2 3	B1 $f(-2)$ seen M1 $x-1 = y^3$ or $\sqrt[3]{(y-1)}$ M2 $(x-1)(x-2) = 0$ or M1 $(x+a)(x+b) = 0$ where $ab = 2$ or $a+b = -3$ If 0 scored give M1 for $x^2 - 3x + 2 = 0$
7	18	(a) $2(x+2)^3$ or $2x^3 + 12x^2 + 24x + 16$ (b) $\sqrt[3]{(x+5)} - 2$ (c) 0	2 3 2	M1 v. clear evidence of $f(x) \times 2$ then add 10 M1 correct first step M1 correct second step M1 $g(-5)$ seen or $2 \times -5 + 10$

8	20	(a) 12 (b) $2x^3$ cao (c) $\sqrt[3]{2(x+1)}$ oe	1 2 3	 M1 clear evidence of adding 1 then multiplying by 4 to $g(x)$ M1 each correct move
9	19	(a) 5 (b) $3x^2 + 1$ (c) $3x - 2$	2 3 2	M1 $f(2) =$ seen M1 $9x^2 + 1$ M1 $(“9x^2 + 1” + 2)/3$ seen M1 for $3y = x + 2$ or $x = \frac{y+2}{3}$
10	21	(a) 4.5 oe (b) x (c) $\frac{x-4}{5}$ oe (d) -3	2 2 2 2	B1 for $[g(5)=] 0.1$ oe M1 for $\frac{1}{2(\frac{1}{2x})}$ seen oe M1 for a correct first step e.g. $y - 4 = 5x$ or $\frac{y}{5} = x + \frac{4}{5}$ or $x = 5y + 4$ M1 for $(\frac{1}{2})^{-3} = 8$ or $(\frac{1}{2})^x = (\frac{1}{2})^{-3}$ or $2^x = \frac{1}{8}$ oe or $2^{-x} = 2^3$
11	16	(a) 1.5 (b) $2(x + 5)$ or $2x + 10$	2 2	B1 for $[g(18) =] 4$ M1 for correct first step e.g. $x = \frac{y}{5} - 5$ or $\frac{x}{2} = y + 5$ or $2y = x - 10$
12	19	(a) 75 (b) 3.5 -6.5 (c) $\frac{x-3}{2}$ oe final answer (d) 5	2 3 2 1	B1 for $[g(6) =] 36$ M1 for $(2x + 3)^2 = 100$ M1 for $2x + 3 = [\pm]10$ If 0 scored, SC1 for one correct value as answer M1 for $x = 2y + 3$ or $y - 3 = 2x$ or $\frac{y}{2} = x + \frac{3}{2}$ or better

13	20	(a)	0.4 or $\frac{2}{5}$	2	B1 for $[f(2)=] 4$ or M1 for $\frac{2}{(3x-2)+1}$ or better
		(b)	-0.8 or $-\frac{4}{5}$	2	M1 for $2=10(x+1)$ or better
		(c)	$3x-6$ or $3(x-2)$ nfw	3	M2 for $3(2x)-2-(3(x+2)-2)$ or M1 for $[f(2x)=]3(2x)-2$ or $[f(x+2)]=3(x+2)-2$
14	16	(a)	64	2	B1 for $[f(1)=] 4$ or M1 for $((x-3)^2)^3$ or better
		(b)	$4x+1$ oe	2	M1 for $x=\frac{y-1}{4}$ or $4y=x-1$
		(c)	$\frac{x^3-1}{4}$ oe final answer	1	
		(d)	3 nfw	1	
15	23	(a)	-13	1	
		(b)	$-3x-1$ or $5-3(x+2)$	1	
		(c)	$9x-10$ cao	2	M1 for $5-3(5-3x)$
		(d)	$\frac{5-x}{3}$ final answer oe	2	M1 for correct first step e.g. $y+3x=5$ or $\frac{y}{3}=\frac{5}{3}-x$ or $y-5=-3x$ or better or for interchanging x and y , e.g. $x=5-3y$, this does not need to be the first step

16	21	(a)	$m = 2$ $n = -10$	2	B1 for $m = 2$ B1 for $n = -10$ If 0 scored SC1 for $(x + 2)^2$ in working or $x^2 + 2mx + m^2 + n$ and equating coefficients $2m[x] = 4[x]$ or $m^2 + n = -6$
		(b)	1.16 or 1.16[2...] from completing square	2FT	FT dep on negative n B1 for $(x + \text{their } m)^2 = -\text{their } n$ or SC1 for correct answer from using formula or for both answers 1.16 and -5.16 whatever method used
17	24	(a)	$9x^2$	1	
		(b)	$\frac{x-5}{3}$	2	M1 for correct first algebraic step e.g. $y - 5 = 3x$ or $\frac{y}{3} = x + \frac{5}{3}$ or better or for interchanging x and y , e.g. $x = 3y + 5$, this does not need to be the first step
		(c)	$9x + 20$ cao final answer	2	M1 for $3(3x + 5) + 5$
18	21	(a)	512	2	B1 for $[f(2) =] 8$ or M1 for $(x^3)^3$ or better
		(b)	$6x - 2$ or $2(3x - 1)$ final answer	2	B1 for $3(2x + 1) - 5$ or better
		(c)	$\frac{1}{2}(x - 1)$ oe	2	M1 for correct first step eg $y - 1 = 2x$ or $\frac{y}{2} = x + \frac{1}{2}$ or $x = 2y + 1$ or better
19	22	(a)	17	2	M1 for $[g(-2) =] 4$ seen or for $5x^2 - 3$
		(b)	$25x^2 - 30x + 9$ or $(5x - 3)^2$ as final answer	2	M1 for $g(5x - 3)$
		(c)	$\frac{x+3}{5}$	2	M1 for $5x = y + 3$ or $x = 5y - 3$ or $\frac{y}{5} = x - \frac{3}{5}$
20	18	(a)	25	1	
		(b)	$\frac{x^2 - 3}{2}$ oe final answer	1	
		(c)	$2x + 3$ final answer	2	M1 for correct first step, e.g. $x = \frac{y-3}{2}$