

## Functions Practice

1a)  $2x^2 + y = 8$   
 $y = -2x^2 + 8$

It is a parabola  
and passes the  
V.L.T.  
 $\therefore$  It is a function.

b)

x	y
1	3
5	3
-2	4
8	6
3	9
-5	4
2	5
7	2

No repetition  
of x-coordinates.  
 $\therefore$  It is a  
function.

c)  $\sqrt{y^2} = \pm \sqrt{4x-9}$   
 $y = \pm \sqrt{4x-9}$   
if  $x=3$   $y = \pm \sqrt{3}$   
 $\therefore$  Not a function.

2. a)  $f(2) = 2(2)^2 - 5(2) + 6$   
 $= 8 - 10 + 6$   
 $= 4$

b)  $f(-5) = 2(-5)^2 - 5(-5) + 6$   
 $= 50 + 25 + 6$   
 $= 81$

c)  $g(9) = 5(9) - 8$   
 $= 45 - 8$   
 $= 37$

d)  $f(2) - g(8)$   
 $= [2(2)^2 - 5(2) + 6] - [5(8) - 8]$   
 $= 8 - 10 + 6 - 40 + 8$   
 $= -28$

3. a)  $f(x-1) = (x-1)^2 - 4(x-1) - 12$   
 $= x^2 - 2x + 1 - 4x + 4 - 12$   
 $= x^2 - 6x - 7$

b)  $g(x^2+3)$   
 $= 2(x^2+3) + 5$   
 $= 2x^2 + 6 + 5$   
 $= 2x^2 + 11$

$$\begin{aligned} &\triangleright g(g(x)) \\ &= g(2x+5) \\ &= 2(2x+5)+5 \\ &= 4x+15 \end{aligned}$$

$$\begin{aligned} 3. \text{c) } f(g(x)) & \\ &= f(2x+5) \\ &= (2x+5)^2 - 4(2x+5) - 12 \\ &= 4x^2 + 20x + 25 - 8x - 20 - 12 \\ &= 4x^2 + 12x - 7 \end{aligned}$$

$$\begin{aligned} \text{d) } g(g(g(x))) &= g(4x+15) \\ &= 2(4x+15)+5 \\ &= 8x+30+5 \\ &= 8x+35 \end{aligned}$$

$$\begin{aligned} 4. \text{a) } y &= 2f(x+3) - 5 & f(x+3) &= (x+3)^2 - 5(x+3) - 18 \\ &= 2(x^2+x-24) - 5 & &= x^2+6x+9-5x-15-18 \\ &= 2x^2+2x-48-5 & &= x^2+x-24 \\ &= 2x^2+2x-53 \end{aligned}$$

$$\begin{aligned} \text{b) } y &= [f(x+1) + 3x + 18]^2 & f(x+1) &= (x+1)^2 - 5(x+1) - 18 \\ &= (x^2 - 3x - 22 + 3x + 18)^2 & &= x^2 + 2x + 1 - 5x - 5 - 18 \\ &= (x^2 - 4)^2 & &= x^2 - 3x - 22 \\ &= x^4 - 8x^2 + 16 \end{aligned}$$

$$\begin{aligned} \text{c) } \text{IROC} &\cong \frac{f(x+h) - f(x)}{h} \\ &\cong \frac{[(x+h)^2 - 5(x+h) - 18] - [x^2 - 5x - 18]}{h} \\ &\cong \frac{x^2 + 2xh + h^2 - 5x - 5h - 18 - x^2 + 5x + 18}{h} \\ &\cong \frac{2xh + h^2 - 5h}{h} \\ &\cong \frac{h(2x + h - 5)}{h} \\ &\cong 2x + h - 5, \quad h \neq 0 \end{aligned}$$

5 a)  $f(a+2) = g(a+2) + 1$   
 $(a+2)^2 + 4(a+2) - 8 = [2(a+2) + 6] + 1$   
 $a^2 + 4a + 4 + 4a + 8 - 8 = 2a + 4 + 6 + 1$   
 $a^2 + 6a - 7 = 0$   
 $(a+7)(a-1) = 0$   
 $a = -7, 1$

b)  $f(n) = 2g(n)$   
 $n^2 + 4n - 8 = 2[2n + 6]$   
 $n^2 + 4n - 8 = 4n + 12$   
 $n^2 - 20 = 0$   
 $\sqrt{n^2} = \pm\sqrt{20}$   
 $n = \pm\sqrt{4}\sqrt{5}$   
 $n = \pm 2\sqrt{5}$

6. Answers vary...

Trial & Error

If  $f(x) = x^2 + 10$

$g(x) = 2x$

then  $f(g(x)) = f(2x)$

$= (2x)^2 + 10$

$= 4x^2 + 10$  ✓

7 a) Answers Vary...  
 Trial & Error

If  $f(x) = 5x$  &  $g(x) = 2x$

$f(g(x)) = f(2x)$   
 $= 5(2x)$   
 $= 10x$

$= 10x$

True!

$g(f(x)) = g(5x)$   
 $= 2(5x)$   
 $= 10x$

$= 10x$

If  $f(x) = 4x$

$f(a-2) = 4(a-2)$   
 $= 4a - 8$

$f(a) - f(2) = 4a - 4(2)$

$= 4a - 8$

True!

If  $f(x) = x^2$  &  $g(x) = 2x$

$f(g(x)) = f(2x)$   
 $= (2x)^2$   
 $= 4x^2$

$= 4x^2$

False!

$g(f(x)) = g(x^2)$   
 $= 2(x^2)$   
 $= 2x^2$

$= 2x^2$

If  $f(x) = 4x - 2$

$f(a-2) = 4(a-2) - 2$   
 $= 4a - 10$

$f(a) - f(2) = (4a - 2) - [4(2) - 2]$

$= 4a - 2 - 8 + 2$

$= 4a - 12$

False!