Function Notation

1. If $f(x) = 2x + 1$ calculate:

   a) $f(1)$ ....   b) $f(-3)$ ....   c) $f(0)$ ....

2. If $f(x) = 4 - x$ calculate:

   a) $f(3)$ ....   b) $f(0)$ ....   c) $f(-2)$ ....

3. If $f(x) = x^2$ calculate:

   a) $f(2)$ ....   b) $f(-4)$ ....   c) $f(\frac{1}{2})$ ....

4. If $f(x) = \frac{x+2}{x-1}$ calculate:

   a) $f(-1)$ ....   b) $f(2)$ ....   c) $f(0)$ ....

5. If $f(x) = \sqrt{x+3}$ calculate:

   a) $f(1)$ ....   b) $f(-3)$ ....   c) $f(13)$ ....

6. If $h(x) = x^2 - 2x + 1$ calculate:

   a) $h(4)$ ....   b) $h(-2)$ ....   c) $h(1)$ ....

7. If $f(x) = x^3$ calculate:

   a) $f(-1)$ ....   b) $f(2)$ ....   c) $f(3)$ ....

8. If $g(x) = \sqrt{4-x}$ calculate:

   a) $g(3)$ ....   b) $g(-5)$ ....   c) $g(0)$ ....

9. If $f(x) = (x-2)^2$ calculate:

   a) $f(5)$ ....   b) $f(-1)$ ....   c) $f(3)$ ....

10. If $h(x) = x^{\frac{1}{2}} + x$ calculate:

    a) $h(9)$ ....   b) $h(0)$ ....   c) $h(1)$ ....

11. If $y = f(x)$ and $f(x) = 2x + 1$ determine the value of x for the following values of y:

a) 3 ....

b) 7 ....

c) -6 ....

12. If $y = f(x)$ and $f(x) = 5 - 3x$ determine the value of x for the following values of y:

a) 8 ....

b) 2 ....

c) -4 ....

13. If $y = g(x)$ and $g(x) = 4x + 3$ determine the value of x for the following values of y:

a) 7 ....

b) 13 ....

c) -1 ....

14. If $y = h(x)$ and $h(x) = 2(1 - x)$ determine the value of x for the following values of y:

a) 9 ....

b) -3 ....

c) -8 ....

15. If $y = g(x)$ and $g(x) = \sqrt{x}$ determine the value of x for the following values of y:

a) 3 ....

b) 1 ....

c) 8 ....

16. If $y = f(x)$ and $f(x) = -3x + 1$ determine the value of x for the following values of y:

a) 10 ....

b) -3 ....

c) -5 ....

Level 3 – 4

17. If $f(x) = 4x - 1$ determine the following expressions. Expand and simplify where possible:

a) $f(x+1)$ ....

b) $f(3-x)$ ....

c) $f(2x+3)$ ....

d) $f(-x)$ ....

e) $f(x^2)$ ....

f) $f(\frac{1}{x})$ ....

18. If $f(x) = x^2 + 3$ determine the following expressions. Expand and simplify where possible:

a) $f(x+2)$ ....

b) $f(-x)$ ....

c) $f(\sqrt{x})$ ....

d) $f(1-x)$ ....

e) $f(3x)$ ....

f) $f(2x-1)$ ....

19. If $f(x) = \frac{x-3}{x+1}$ determine the following expressions. Simplify where possible:

a) $f(x-1)$ ....

b) $f(x^2)$ ....

c) $f(\frac{1}{2}x)$ ....

d) $f(2x)$ ....

e) $f(3-x)$ ....

f) $f(2x+3)$ ....

Level 5 – 6

20. The following shows the graphs of $y = f(x)$ and $y = g(x)$:
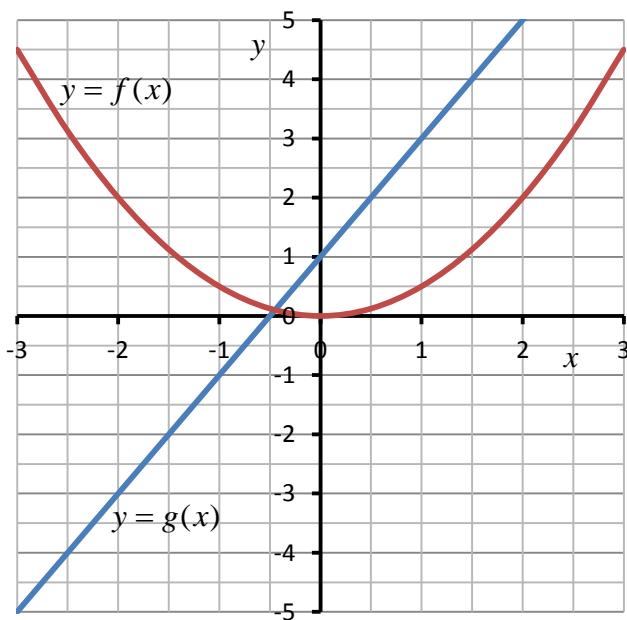
Determine the following values:

a) $f(2)$ ....

b) $g(0)$ ....

c) $f(-3)$ ....

d) $g(f(1))$ ....

e) $f(g(-1))$ ....

f) $g(g(-2))$ ....

21. A function $f(x)$ is *even* if $f(x) = f(-x)$. The function is *odd* if $f(x) = -f(-x)$. Determine whether the following functions are even, odd or neither. Justify your answers.

a) $f(x) = 2x^2$ ....

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b) $f(x) = 3 - x$ ....

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c) $f(x) = x^2 - x$ ....

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d) $f(x) = 2x^3$ ....

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e) $f(x) = 2$ ....

....

f) $f(x) = 2x^4 + 3$ ....

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g) $f(x) = -x^5 + x$ ....

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h) $f(x) = x^{-2} + 5$ ....

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22. Write down a function that is both even and odd. *Hint: your function will be similar to 21e).*

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23. If $f(x) = 2x + 1$ and $g(x) = 3x - 2$, solve the equation $f(g(x)) = 4$.

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24. If $f(x) = 3 - x$ and $g(x) = \dfrac{3}{x}$, solve the equation $f(g(x)) = 2$.

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25. a) Use your GDC to plot the graphs of all of the even functions from question 21. What do you notice about each graph? *Hint: you may also wish to plot the other functions to see if you notice any differences.*

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b) What do you notice about all of the odd functions?

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26. Use the graphs to find **integer** solutions to the following. Each question has two solutions.
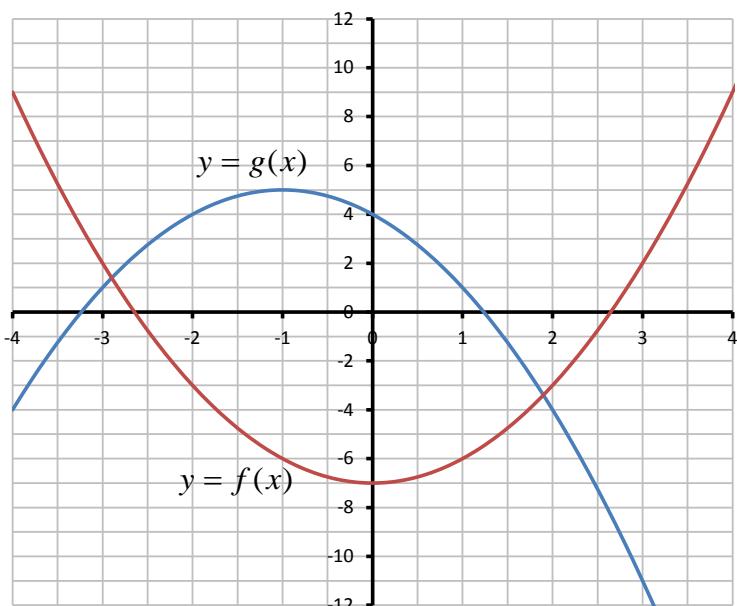
i) $f(g(x)) = -6$ ....

ii) $g(f(x)) = -4$ ....

iii) $f(f(x)) = 2$ ....

27. Determine $f(x)$ for the following. Expand and simplify your answers where necessary:

a) $f(x+2) = 3x - 1$

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b) $f(\frac{1}{2}x) = x^2 + x - 1$

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       ....

c) $f(2x-1) = x^2 + 3x - 2$

       ....

       ....

d) $f(\frac{x+1}{3}) = (1-x)(x+3)$

       ....

       ....

e) $f(\frac{2}{x}) = 3x + 4$

       ....

       ....

28. If $f(x) = x^2 - 2x + 1$ and $g(f(x)) = x$, determine $g(x)$.

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29. If $g(x) = x^2 - 3$ and $g(f(x)) = x$, determine $f(x)$.

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30. Let $f(x) = 1 + x$ and:

$$f^1(x) = f(x)$$
$$f^2(x) = f(f(x))$$
$$f^3(x) = f(f(f(x)))$$

etc.

a) Write down the following functions in terms of x.

      i) $f^1(x)$ ....

      ii) $f^2(x)$ ....

      iii) $f^3(x)$ ....

      iv) $f^4(x)$ ....

b) Solve the equation $f^n(4) = 2n$ for n.

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