St Peter the Apostle High School

Maths Department

Higher Practice Questions

2. Functions

1 State the range of each function given its domain:

(a) $f(x) = 3x - 4$; $x \in \{2, 3, 4, 5\}$

(b) $f(x) = x^2 - 3x + 4$; $x \in \{-2, -1, 0, 1, 2\}$

(c) $f(x) = 3x^2 - 7$; $x \in \{-3, -2, 0, 2, 3\}$

(d) $f(x) = \frac{x^2+3}{2x-1}$; $x \in \{1, 3, 5, 7\}$

2 State a suitable domain for the following functions:

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

(b) $f(x) = \frac{4x-2}{2x-3}$

(c) $f(x) = \frac{x^2+5}{(x-1)(x+4)}$

(d) $f(x) = \frac{4x^2}{x^2-3x}$

(e) $f(x) = \frac{2x+7}{x^2-16}$

(f) $f(x) = \frac{x^2-5x+4}{x^2+8x+12}$

3 Given $f(x) = x + 1$, $g(x) = x^2$, and $h(x) = x^2 - 2$, find the following functions:

(a) $f(g(x))$ **(b)** $f(h(x))$ **(c)** $f(f(x))$

(d) $g(f(x))$ **(e)** $g(h(x))$ **(f)** $g(g(x))$

(g) $h(f(x))$ **(h)** $h(g(x))$ **(i)** $h(h(x))$

4 Given $f(x) = x^2$, $g(x) = 3x + 1$, and $h(x) = 4 - 2x$, find the following functions:

(a) $f(g(x))$ **(b)** $f(h(x))$ **(c)** $f(f(x))$

(d) $g(f(x))$ **(e)** $g(h(x))$ **(f)** $g(g(x))$

(g) $h(f(x))$ **(h)** $h(g(x))$ **(i)** $h(h(x))$

5 Given $f(x) = 2x$ and $g(x) = \cos x$, find the following functions:

(a) $f(g(x))$ **(b)** $g(f(x))$ **(c)** $f(f(x))$

6 Given $h(x) = 3x^2 + 6x + 2$

(a) Show that $h(x-1) = 3x^2 - 1$

(b) Find a simplified expression for $h(x+1)$

(c) Hence simplify $\frac{h(x+1) - h(x-1)}{2}$

7 Given $f(x) = \frac{x}{1-x}$, simplify

(a) $f(x-1)$ **(b)** $f\left(\frac{1}{x}\right)$ **(c)** $f\left(\frac{1}{x+1}\right)$ **(d)** $f\left(\frac{1}{1-x}\right)$

8 $f(x) = 3x - 2$ and $g(x) = \frac{x+2}{3}$,

(a) Find $f(g(x))$ and $g(f(x))$

(b) State a relationship between $f(x)$ and $g(x)$

9 $f(x) = 2x + 5$ and $g(x) = \frac{x-5}{2}$,

(a) Find $f(g(x))$ and $g(f(x))$

(b) State a relationship between $f(x)$ and $g(x)$

10 $f(x) = 6x - 3$ and $g(x) = \frac{x+3}{6}$,

(a) Find $f(g(x))$ and $g(f(x))$

(b) State a relationship between $f(x)$ and $g(x)$

11 Find the inverse of each of the following functions

(a) $f(x) = 3x - 4$

(b) $g(x) = 5x + 2$

(c) $h(x) = 2x - 6$

(d) $f(x) = \frac{1}{2}x + 5$

(e) $g(x) = \frac{1}{4}x - 3$

(f) $h(x) = 7 - 3x$

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

(h) $g(x) = \frac{2x - 4}{5}$

(i) $h(x) = \frac{3x + 2}{4}$

(j) $f(x) = \frac{6 - 3x}{2}$