Pre-Calculus 12A

Unit Test: Functions **Name:_____**

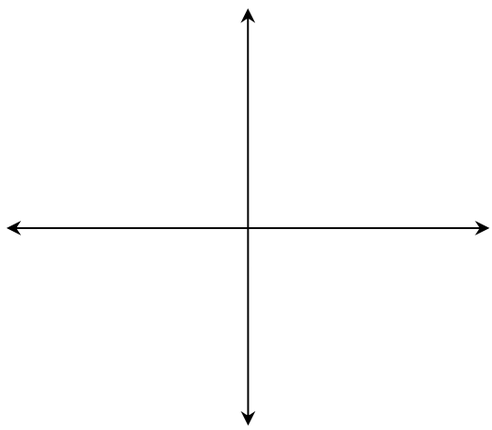
[52 MARKS]

Show all work for each of the following in the space provided.

1. Given the function $f(x)=\begin{cases}(x+2)^2-1 & \text{if } x<-1\\ 3x+1 & \text{if } -1\le x\le 2\\ 5 & \text{if } x>2\end{cases}$ [6]

(a) Evaluate $f(-1)+4f(0)-f(2)$

(b) Sketch $f(x)$ on the axes provided below.



2. Given that $f(x)=x^2-2$, $g(x)=-2x+1$, *and* $w(x)=\sqrt{7-x}$ …

(a) Evaluate $(g-w)(-2)$ [3]

(b) Evaluate $(f\circ g\circ w)(-9)$ [3]

(c) Determine an expression in simplest form for $f\left[w(3y^2)\right]-2g(y^2-1)+f(3y-5)$ [5]

3. The base function $g(x)=x^3$ is reflected in the *y*-axis, stretched horizontally by a factor of $\frac{2}{7}$, stretched vertically by a factor of 3 and translated 2 units to the left and 6 units down.

(a) Write the equation of the transformed function *f*(*x*). [4]

(b) Write a mapping rule that would map the function $g(x)$ to this new function after all of the above transformations have been applied. [4]

(c) If the ordered pair (-21 , 8) lies on the graph of *g*(*x*), what are the coordinates of this point on the graph of transformed function? [2]

4. Given that $g(x)=7f(-3x+12)-5$, complete the chart shown below. When identifying translations be sure that you indicate both the number of units and direction of the shift. [8]

(i) Complete the chart shown below

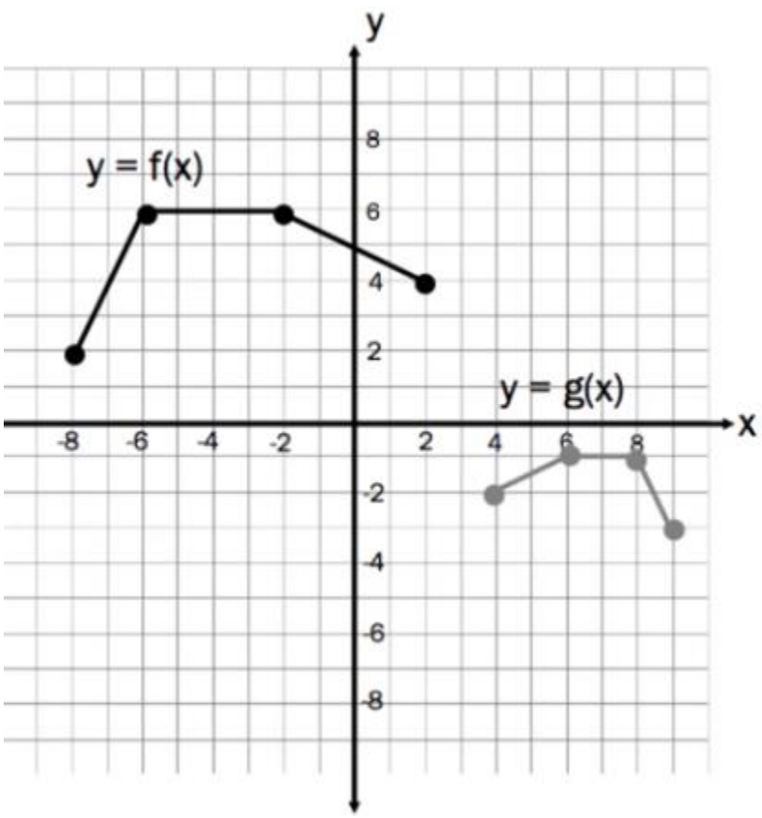
Reflected in *x*-axis	YES or NO (circle correct solution)
Reflected in *y*-axis	YES or NO (circle correct solution)
Horizontal translation of…	
Vertical translation of…	
Horizontally stretched by a factor of…	
Vertically stretched by a factor of …	

(ii) Write a mapping rule to transform $f(x)$ to the function $g(x)$. [4]

(iii) If the ordered pair (- 9 , 3) is on the graph of *f*(*x*), determine the coordinates of this point if it were located on the graph of $g^{-1}(x)$. [3]

5. Given the function $f(x) = 3x^3 - 1$, determine $f^{-1}(x)$ and the coordinates of $f^{-1}(23)$. [4]

6. (a) Given the graphs of $y = f(x)$ and $y = g(x)$, express the equation for $g(x)$ in the form $g(x) = af(b(x-c)) + d$. [4]



(b) State the domain and range of the function ***f(x).*** [2]