Bayview Secondary School
Math Department – Course Code: **MHF4U**
Assessment As Learning For **Unit SIX– Combinations of Functions**

Name _____ #____

K – 19	A – 17	C - 2

Knowledge and Understanding (K)

1) Given:
$f = \{(-4,6),(-2,4),(0,2),(4,-5)\}$
$g(x) = 2x + 5 \rightarrow (-4,-3),(-2,1),(0,5),(4,13)$
$h = \{(-4,-1),(-3,1),(-2,4),(0,7),(4,10)\}$ $h^{-1}(x)=\{(-1,-4),(1,-3),(4,-2),(7,0),(10,4)\}$
Determine each of the following: [2 marks each]

a) $(f+g) = \{(-4,3),(-2,5),(0,7),(4,8)\}$

b) $\frac{f}{g} = \{(-4,-2),(-2,4),(0,\frac{2}{5}),(4,\frac{-5}{13})\}$

c) $f \circ h = \{(-2,-5)\}$ $f(h(x))$

d) $f \times h = \{(-4,-6),(-2,16),(0,14),(4,-50)\}$

e) $f \circ h^{-1}$ $\{(-1,6),(4,4),(7,2),(10,-5)\}$

2) Given: [9 marks total]

$$f(x) = 3\sin(x)$$
$$g(x) = 6\cos(x)$$
$$h(x) = (x-4)(x+2)(x+5)$$
$$k(x) = x - 2$$
$$m(x) = \frac{1}{x}$$
$$n(x) = x(x+5)$$

Write the simplified function for each of the following

a) $(f+g)(x) = 3\sin(x) + 6\cos(x)$

b) $(fg)(x) = 3\sin(x)\,6\cos(x)$
$= 18\sin(x)\cos(x)$
$= 9\sin(2x)$

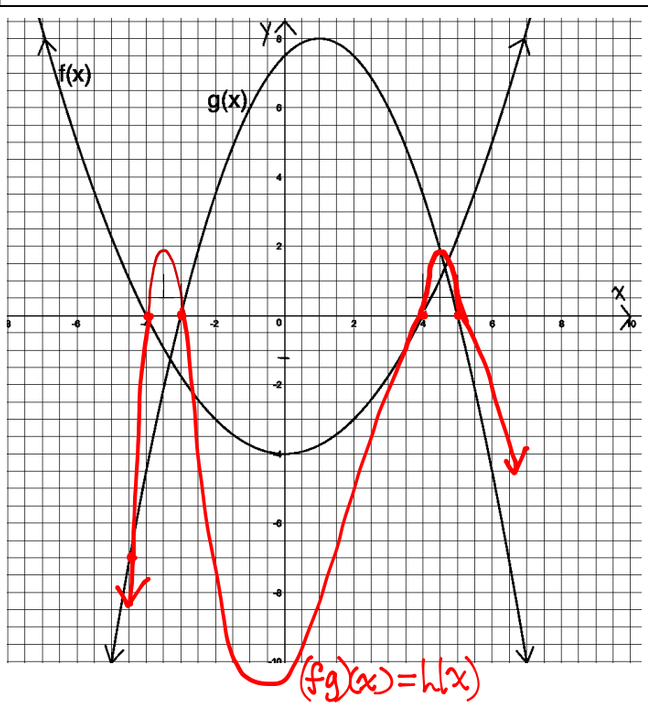
c) $\left(\frac{n}{m}\right)(x) = \frac{x(x+5)}{\frac{1}{x}}$
$= x^2(x+5),\ x \neq 0$

d) $(h \circ k)(x) = h(x-2)$
$= ((x-2)-4)((x-2)+2)((x-2)+5)$
$= (x-6)(x)(x+3)$
$= x(x-6)(x+3)$

e) $\left(\frac{h}{n}\right)(x) = \frac{(x-4)(x+2)(x+5)}{x(x+5)}$
$= \frac{(x-4)(x+2)}{x},\ x \neq -5, 0$

Application

3) Given the graphs of the following functions, sketch a graph of the requested new function. (Be sure to label or mention any asymptotes)
a) Sketch $(fg)(x)$ [4 marks]



$f(x)$: $a(x-4)(x+4)$ vertex $(0,-4)$
$-4 = a(-4)(4)$
$\frac{-4}{-4(4)} = a$
$a = \frac{1}{4}$
$\therefore f(x) = \frac{1}{4}(x^2-16)$

$g(x)$: $a(x+3)(x-5)$ vertex $(1,8)$
$8 = a(1+3)(1-5)$
$8 = a(4)(-4)$
$\frac{8}{-16} = a$
$a = \frac{-1}{2}$
$g(x) = \frac{-1}{2}(x+3)(x-5)$

b) Sketch $\frac{f}{g}(x)$ [6 marks]

$$h(x)=\frac{0.25(x-4)(x+4)}{-0.5(x+3)(x-5)}$$

x-int $= 4, -4$

y-int $= \frac{-8}{15}$

V.A. $x=-3$, $x=5$

H.A. $y=\frac{0.25}{-0.5}=\frac{-1}{2}$

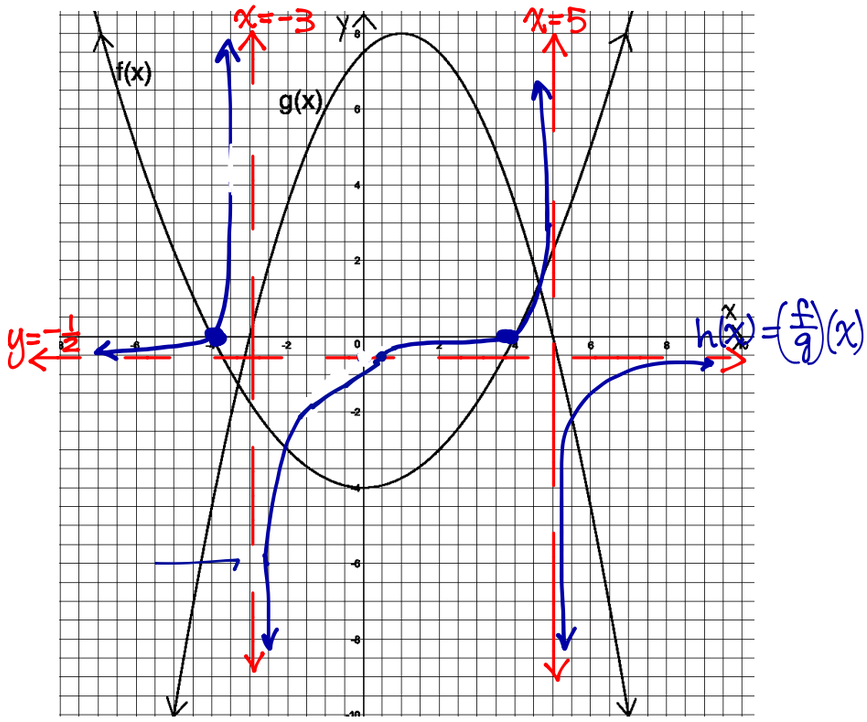
Cross test:

$$\frac{-1}{2}=\frac{(x+4)(x-4)}{2(x+3)(x-5)}$$

$$x^2-16=x^2-2x-15$$

$$-1=-2x$$

$$\frac{1}{2}=x$$



c) Sketch $(f+g)(x)$ [3 marks]

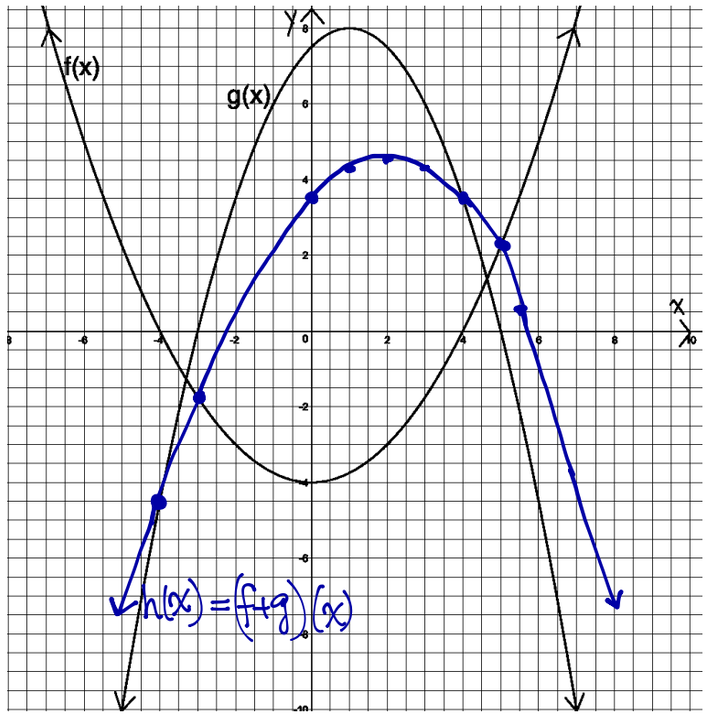
$$h(x)=(f+g)(x)$$

$$=\frac{1}{4}(x^2-16)-\frac{1}{2}(x+3)(x-5)$$

$$=\frac{1}{4}x^2-4-\frac{1}{2}(x^2-2x-15)$$

$$=\frac{1}{4}x^2-4-\frac{1}{2}x^2+x+\frac{15}{2}$$

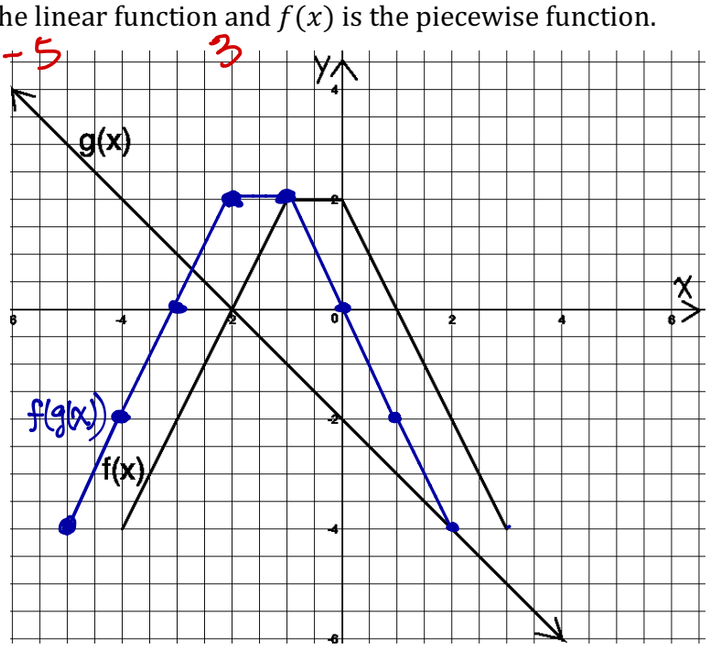
$$=\frac{-1}{4}x^2+x+\frac{15}{2}$$



d) Sketch $(f\circ g)(x)$ given that $g(x)$ is the linear function and $f(x)$ is the piecewise function. [4 marks]

g(x) x	g(x) y	f(g(x))
-5	3	-4
-4	2	-2
-3	1	0
-2	0	2
-1	-1	2
0	-2	0
1	-3	-2
2	-4	-4
3	-5	DNE

f(x) x	f(x) y
-4	-4
-3	-2
-2	0
-1	2
0	2
1	0
2	-2
3	-4



Two marks will be awarded for proper mathematical forms throughout the assessment. [2 marks]