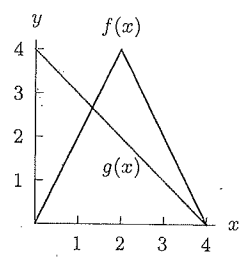


Name: KEY



# Sheet # 341 Chain Rule and Graphs

Use the definitions of  $f(x)$  and  $g(x)$  in the graphs of Figure.

Make tables with your answers with  $x$  as rows and function values as columns.

Some quantities do not exist.

- Find:  
 $f(0), f(1), f(2), f(3), f(4)$   
 $g(0), g(1), g(2), g(3), g(4)$   
 $f'(0), f'(1), f'(2), f'(3), f'(4)$   
 $g'(0), g'(1), g'(2), g'(3), g'(4)$

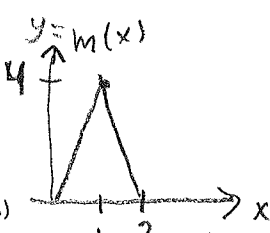
$x$	$f$	$g$	$f'(x)$	$g'(x)$	$g(f(x))$	$g(g(x))$
0	0	4	2	-1	$g(0) = 4$	$g(4) = 0$
1	2	3	2	-1	$g(2) = 2$	$g(3) = 1$
2	4	2	DNE	-1	$g(4) = 0$	$g(2) = 2$
3	2	1	-2	-1	$g(2) = 2$	$g(1) = 3$
4	0	0	-2	-1	$g(0) = 4$	$g(0) = 4$

NOTE:  
 $g(g(x)) = x$   
 $g$  is its own inverse!

- Find:  
 $g(f(0)), g(f(1)), g(f(2)), g(f(3)), g(f(4))$

- Find:  
 $g(g(0)), g(g(1)), g(g(2)), g(g(3)), g(g(4))$

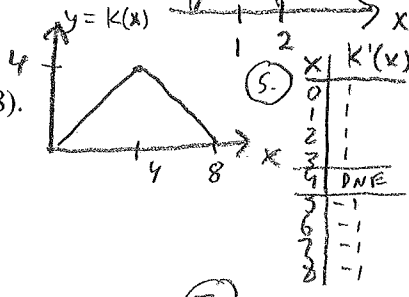
- Let  $m(x) = f(2x)$ .  
 Find:  
 $m'(0), m'(0.5), m'(1), m'(1.5), m'(2), m'(3), m'(4)$



④

$x$	FROM GRAPH	FROM FORMULA
0	4	$f'(0) \cdot 2 = 2 \cdot 2 = 4$
0.5	4	$f'(1) \cdot 2 = 2 \cdot 2 = 4$
1	DNE	$f'(2) \cdot 2 = \text{DNE}$
1.5	-4	$f'(3) \cdot 2 = (-2) \cdot 2 = -4$
2	-4	$f'(4) \cdot 2 = (-2) \cdot 2 = -4$
3	DNE	$f'(6) \cdot 2 = \text{DNE}$
4	DNE	$f'(8) \cdot 2 = \text{DNE}$

- Let  $k(x) = f(x/2)$ .  
 Find:  
 $k'(0), k'(1), k'(2), k'(3), k'(4), k'(6), k'(8)$



- Let  $r(x) = f(4x)$ .  
 Find:  
 $r'(0), r'(0.25), r'(0.5), r'(1), r'(2), r'(4)$

⑥

$x$	$r'(x)$
0	8 $f'(0) \cdot 4 = 2 \cdot 4 = 8$
1/4	8 $f'(1) \cdot 4 = 2 \cdot 4 = 8$
1/2	DNE $f'(2) \cdot 4 = \text{DNE}$
1	-8 $f'(4) \cdot 4 = -2 \cdot 4 = -8$
2	DNE
4	DNE

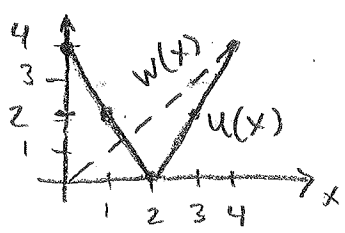
- Let  $u(x) = g(f(x))$ .  
 Find:  
 $u'(1), u'(2), u'(3)$

⑦ CHAIN RULE

$x$	$u'(x) = g'(f(x)) \cdot f'(x)$	$w'(x) = g'(g(x)) \cdot g'(x)$
1	$g'(2) \cdot 2 = -1 \cdot 2 = -2$	$g'(3) \cdot -1 = -1 \cdot -1 = 1$
2	$g'(4) \cdot \text{DNE} = \text{DNE}$	$g'(2) \cdot -1 = 1$
3	$g'(2) \cdot -2 = -1 \cdot -2 = 2$	$g'(1) \cdot -1 = 1$

- Let  $w(x) = g(g(x))$ .  
 Find:  
 $w'(1), w'(2), w'(3)$

## GRAPHS OF $u(x)$ AND $w(x)$



Slopes agree with TABLE USING CHAIN RULE FORMULA.