MacBook Pro

23/23

Tecnológico de Monterrey Preparatoria

More on rules of derivatives
By: Designing team

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1. If $f(5)=1$, $f'(5)=6$, $g(5)=-3$, $g'(5)=2$. Find the values of

$f(5)=1 \quad g(5)=-3)$
$f'(5)=6 \quad g'(5)=2$

a) $(f\cdot g)'(5) = (fg)'(5) = -16$
b) $(f/g)'(5) \quad (f/g)'(5) = -20/9$
c) $(g/f)'(5) \quad (g/f)'(5) = 20$

c) $(g/f)'(5) = \dfrac{fg' - gf'}{f^2}$
$= \dfrac{(1)(2) - (-3)(6)}{1^2} = \dfrac{2+18}{1}$
$= 20$

2. If $f(3)=4$, $g(3)=2$, $f'(3)=-6$ and $g'(3)=5$, find the following values

$f(3)=4 \quad g(3)=2$
$f'(3)=-6 \quad g'(3)=5$

a) $(f+g)'(3) = f'(3)+g'(3) = -6+5 = -1$
b) $(f\cdot g)'(3) = (4)(5)+(2)(-6) = 20-12 = 8$
c) $(f/g)'(3) = \dfrac{gf'-fg'}{g^2} = \dfrac{(2)(-6^2)-(4)(5)}{2^2} = \dfrac{-12-20}{4} = -\dfrac{32}{4} = -18$

3. If $h(x)=f(x)g(x)$, use the table to find $h'(-1)$, $h'(0)$ and $h'(1)$

x	f(x)	f'(x)	g(x)	g'(x)
-1	2	1	1	2
0	-1	0	-1	3
1	2	-1	0	5

$h'(-1) = f(-1)g'(-1) + g(-1)f'(-1)$
$h'(-1) = (2)(2)+(1)(1)$
$= 4+1$
$h'(1) = 5$

$h'(0) = f(0)g'(0) + g(0)f'(0)$
$h(0) = (-1)(3) + (-1)(0)$
$h(0) = -3$

$h'(1) = f(1)g'(1) + g(1)f'(1)$
$h'(1) = (2)(5) + (0)(-1)$
$h'(1) = 10$

4. If $h(x)=f(x)/g(x)$, use the table to find $h'(-1)$, $h'(0)$ and $h'(1)$

x	f(x)	f'(x)	g(x)	g'(x)
-1	2	1	1	2
0	-1	0	-1	3
1	2	-1	2	5

$h'(-1) = \dfrac{g(-1)f'(-1) - f(-1)g'(-1)}{g^2}$
$h'(-1) = \dfrac{(1)(1)-(2)(2)}{(1)^2}$
$h'(-1) = -3$

$h'(0) = \dfrac{g(0)f'(0) - f(0)g'(0)}{g^2}$
$h'(0) = \dfrac{(-1)(0)-(-1)(3)}{(-1)^2}$
$h(0) = 3$

$h'(1) = \dfrac{g(1)f'(1) - f(1)g'(1)}{g^2}$
$h(1) = \dfrac{(2)(-1)-(2)(5)}{(2)^2}$
$h'(1) = \dfrac{-2-10}{4} = \dfrac{-12}{4}$
$h'(1) = -3$

DERIVATIVE = SLOPE

5. Considering that $P(x) = F(x)G(x)$ y $Q(x) = F(x)/G(x)$, where F and G are functions whose graphs are shown below.

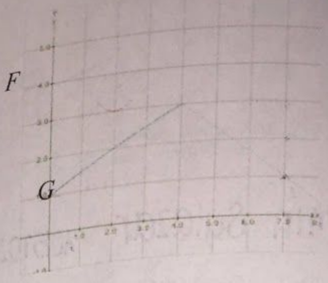
a) Find $P'(2)$

$P'(2) = F\,G' + GF'$
$P'(2) = (3)(1/2) + (2)(0)$
$P'(2) = 3/2$

b) Find $Q'(7)$

$Q(7) = \dfrac{gf'-fg'}{g^2}$
$Q(7) = \dfrac{(1)(-1/4) - (5)(2/3)}{1^2}$
$Q(7) = \dfrac{-1/4 - (10/3)}{1}$
$Q'(7) = -43/12$

$g(7)=1$ $g'(7)=2/3$
$f(7)=5$ $f'(7)=1/4$



$h'(x)=f'(g(x))\,g'(x)$

6. Consider that $h(x)=f(g(x))$, find $h'(-1)$, $h'(0)$ and $h'(1)$

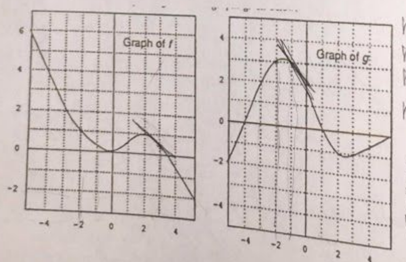
x	f(x)	f'(x)	g(x)	g'(x)
-1	2	1	1	2
0	-1	0	-1	3
1	2	-1	0	5

$h'(-1)=f'(g(-1))g'(-1)$
$h'(-1)=f'(1)g'(-1)$
$h'(-1)=(-1)(2)$
$h'(-1)=-2$

$h'(0)=f'(g(0))g'(0)$
$h'(0)=f'(-1)g'(0)$
$h'(0)=(1)(3)$
$h'(0)=3$

$h'(1)=f'(g(1))g'(1)$
$h'(1)=f'(0)g'(1)$
$h'(1)=(0)(0)$ $h'(1)=0$

7. Consider that $h(x)=f(g(x))$, where f and g are functions whose graphs are shown below.



$h(x)=f(g(x))$
$h(-2)=f(g(-2))$
$h(-2)=f(3)$
$h(-2)=1/2$

$h(3)=f(g(3))$
$h(3)=f(-1)$
$h(3)\simeq 0.25$

a) Evaluate $h(-2)$ and $h(3)$
b) Is $h'(-3)$ positive, negative or zero? Explain your answer. 0
c) Is $h'(-1)$ positive, negative or zero? Explain your answer. +

b) $h'(-3)=f'(g(-3))(g(-3))$
$h'(-3)=f'(-2)\,g'(-3)$
$h'(-3)=(0)(1)=0$

c) $h'(-1)=f'(g(-1))(g'(-1))$
$h'(-1)=f'(3)\,g'(-1)$
$h'(-1)=(-)\,(-)=+$