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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

a) $(f\cdot g)'(5)$ $fg'+gf'$ $(1)(2)+(-3)(6)=2-18$ $(f\cdot g)'(5)=-16$

b) $(f/g)'(5)$ $\frac{gf'-fg'}{g^2}$ $\frac{(-3)(6)-(1)(2)}{(-3)^2}=-\frac{20}{9}$ $(f/g)'(5)=-\frac{20}{9}$

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

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

a) $(f+g)'(3)$ $f'(3)+g'(3)=-6+5$ $(f+g)'(3)=-1$

b) $(f\cdot g)'(3)$ $fg'+gf'$ $(4)(5)+(2)(-6)$ $(f\cdot g)'(3)=8$

c) $(f/g)'(3)$ $\frac{gf'-fg'}{g^2}$ $\frac{[(2)(-6)-(4)(5)]}{4}=\frac{-12-20}{4}=-\frac{32}{4}$ $(f/g)'(3)=-8$

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

$h'(-1)=fg'+gf'$ $(2)(2)+(1)(1)$ $h'(-1)=5$

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

$h'(1)=(2)(5)+(0)(\cdot)$ $h'(1)=10$

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

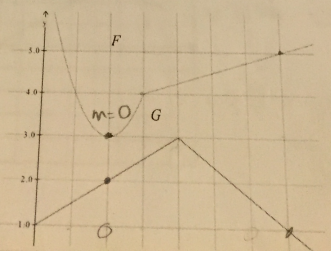
$\frac{gf'-fg'}{g^2}$ $h'(1)=(2)(-1)-10/4$ $h'(1)=-3$

$h'(-1)=-\frac{(3)(-1)}{1}$ $h'(-1)=3$

$h'(0)=\frac{1-4}{1}$ $h'(0)=-$

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 $P'(2)$ b) Find $Q'(7)$



$P'(2)=fg'+gf'$

$F(2)=3$ $G(2)=2$

$F'(2)=\emptyset$ $G'(2)=\frac{1}{2}$

$P'(2)=(3)(\frac{1}{2})+(2)(0)$ $P'(2)=3/2$

$Q'(7)=\frac{6F'-FG'}{G^2}$

$F(7)=5$ $G(7)=1$

$F'(7)=1/4$ $G'(7)=3$

$Q'(7)=\frac{1/4+19/3}{1}$ $Q'(7)=43/12$

-2 # (procedure on the back).

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

$h'(1) = f'(g(1))\, g'(1)$

$h'(1) = f'(0)\,(5)$

$h'(1) = \emptyset$ #

$h'(0) = f'(g(0))\, g'(0)$

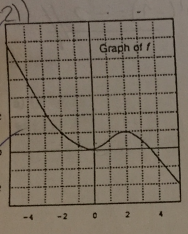
$h'(0) = f'(-1)\, g'(3)$

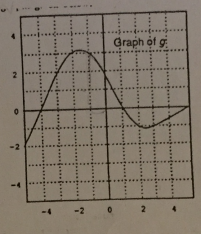
$h'(0) = (1)(3)$

$g'(0) = 3$

$h'(0) = 3$ #

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





a) $h(-2) = f(g(-2))$

$h(-2) = f(3)$

$h(-2) = 0.5$

a) $h(3) = f(g(3))$

$h(3) = f(-1)$

$h(3) = 1/3$ #

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

$f'(2) \cdot g'(-3)$

$(0) \cdot (+) = \emptyset$

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

$f'(3) \cdot g'(-1)$

$(-) \cdot (-) = (+)$

a) Evaluate $h(-2)$ and $h(3)$

b) Is $h'(-3)$ positive, negative or zero? Explain your answer. zero; because $f'(2) = \emptyset$ so anything multiplied by it would be $\emptyset$.

c) Is $h'(-1)$ positive, negative or zero? Explain your answer. positive, because both derivatives are negative & due to law of signs, $h'(-1) = +$.

8. If $f(x)$ and $g(x)$ are the functions whose graphs are shown, let $u(x) = f(x) \cdot g(x)$ and $v(t) = f(x) / g(x)$

a) Find $u'(1)$ b) Find $v'(5)$

$f(5) = 3$

$g(5) = 2$

$f'(5) = -1/3$

$g'(5) = 2/3$

$u'(1) = fg' + gf'$

$u'(1) = -2 + 2$

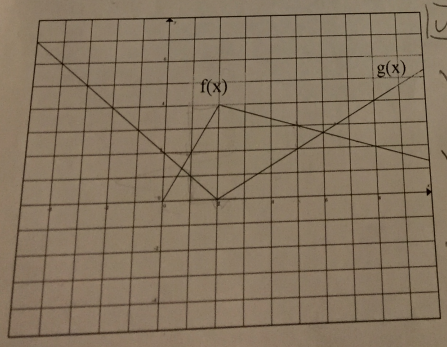
$u'(1) = \emptyset$

$f(1) = 2$

$g(1) = 1$

$f'(1) = 2$

$g'(1) = -1$



$v'(5) = \dfrac{gf' - fg'}{g^2}$

$v'(5) = \dfrac{-\frac{2}{3} - \frac{6}{3}}{4}$

$v'(5) = \dfrac{-\frac{8}{3}}{\frac{4}{1}} = \dfrac{-8}{12}$

$v'(5) =$