23/23

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

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

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

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

a) $(f+g)'(3) = (-6)+(5) = \boxed{-1}$

b) $(f\cdot g)'(3) = (4)(5)+(2)(-6) = 20-12 = \boxed{8}$

c) $(f/g)'(3) = \dfrac{(2)(-6)-(4)(5)}{4} = \dfrac{-12-20}{4} = -\dfrac{32}{4} = \boxed{-8}$

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

$h = f\cdot g$
$h' = fg' + gf'$

* answers at the back

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

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

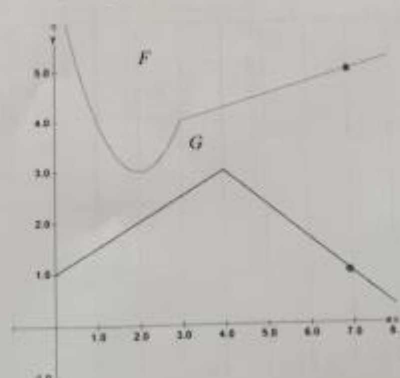
5. Considering that $P(x) = F(x)G(x)$ y $Q(x) = F(x)/G(x)$, where F and G are functions whose graphs are shown below.

a) Find $P'(2)$ $\qquad$ b) Find $Q'(7)$

$Q(x) = \dfrac{F(x)}{G(x)}$

a)
$P(2) = F\cdot G' + GF'$
$P'(2) = (3)(1/2)+(2)(0)$
$\boxed{P'(2) = \dfrac{3}{2}}$

$F(2) = 3$ $\quad G(2) = 2$
$F'(2) = 0$ $\quad G'(2) = \dfrac{1}{2}$



b) $Q(x) = \dfrac{gf' - fg'}{g^2}$

$G(7) = 1$ $\quad F(7) =$
$G'(7) = \dfrac{2}{3}$ $\quad F'(7) =$

$= \boxed{\dfrac{43}{12}}$

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

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

$h'(-1) = 4 + 1$

$\boxed{h'(-1) = 5}$

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

$\boxed{h'(1) = 10}$

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

$\boxed{h'(0) = -3}$

④ $h(x) = \frac{f(x)}{g(x)} = \frac{gf' - fg'}{g^2}$

$h'(-1) = \frac{(1)(1) - (2)(2)}{1} = \frac{1-4}{1} = \boxed{-3}$

$h'(1) = \frac{(2)(-1) - (2)(5)}{4} =$

$h'(1) = \frac{-2 - 10}{4} = \frac{-12}{4}$

$h'(0) = \frac{(-1)(0) - (-1)(3)}{1} = \boxed{3}$

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

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

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

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

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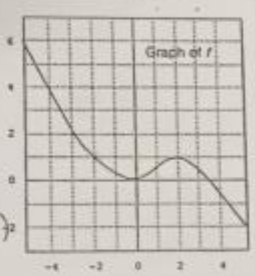
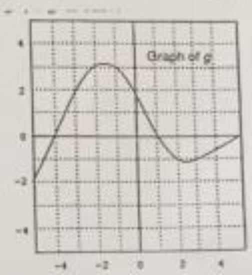
7. Consider that $h(x) = f(g(x))$, where f and g are functions whose graphs are shown below.





$f(-2) = 1$

f

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

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

$h(3) \simeq 0.25$

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

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

$h(-2) = 0.5$

a) Evaluate $h(-2)$ and $h(3)$ $h(-2) = 0.5$ $h(3) = 0.25$

b) Is $h'(-3)$ positive, negative or zero? Explain your answer. zero

c) Is $h'(-1)$ positive, negative or zero? Explain your answer. positive

b) $h'(3) = f'(g(-3))g'(-3)$

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

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

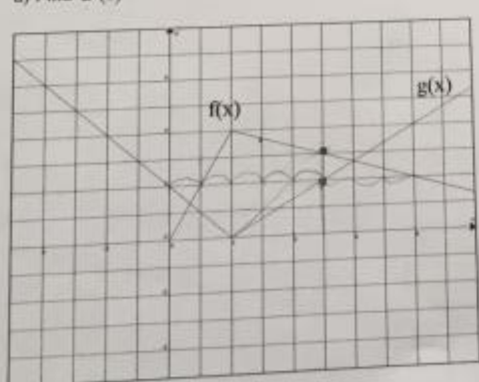
c) $h'(-1) = f'(g(-1))g'(-1)$

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

$h'(-1) =$ positive $(-)(-) = (+)$

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 $v'(5)$



$f(1) = 2$

$g(1) = 1$

$f'(1) = 2$

$g'(1) = -1$

$f(5) = 3$

$g(5) = 2$

$f'(5) = \frac{-1}{3}$

$g'(5) = \frac{2}{3}$

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

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

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

$\boxed{u'(1) = 0}$

$v'(x) = \frac{f(x)}{g(x)} = \frac{gf' - fg'}{g^2}$

$v'(5) = \frac{(2)(^{-1}/_3) - (3)(^2/_3)}{4}$

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

$\frac{2}{3}$

$\boxed{v'(5) = -\frac{2}{3}}$

⑥ $h'(-1) = f'(g(-1))\, g'(-1)$

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

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

$\boxed{h'(-1) = -2}$

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

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

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

$\boxed{h'(0) = 3}$

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

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

$h'(1) = (0)(5)$

$\boxed{h'(1) = 0}$