AP Calculus AB

Name ______________________________

Finding Derivatives using a Table

Two functions, f and g, are continuous and differentiable for all real numbers. Some values of the functions and their derivatives are shown in the table.

x	0	1	2	3	4
f(x)	$\frac{1}{2}$	$\frac{1}{3}$	1	-1	3
g(x)	-2	1	$-\frac{1}{2}$	2	$-\frac{1}{3}$
f'(x)	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{1}{4}$	0	$-\frac{4}{5}$
g'(x)	-1	$\frac{2}{3}$	-4	-3	$-\frac{1}{3}$

Based on the table, find the following derivatives:

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

1) $\frac{d}{dx}(f(x)+g(x))$, evaluated at x = 4.

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

$= f'(4) + g'(4)$

$= -\frac{4}{5} + -\frac{1}{3}$

$= \frac{-12}{15} + \frac{-5}{15} = \boxed{\frac{-17}{15}}$

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

2) $\frac{d}{dx}(f(x) \cdot g(x))$, evaluated at x = 1.

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

$= f(1)g'(1) + g(1)f'(1)$

$= \left(\frac{1}{3}\right)\left(\frac{2}{3}\right) + (1)\left(\frac{5}{3}\right)$

$= \frac{2}{9} + \frac{5}{3}$

$= \frac{2}{9} + \frac{15}{9} = \boxed{\frac{17}{9}}$

3) $\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right)$, evaluated at x = 0.

$= \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$

$= \frac{g(0)f'(0) - f(0)g'(0)}{[g(0)]^2}$

$= \frac{(-2)\left(\frac{3}{2}\right) - \left(\frac{1}{2}\right)(-1)}{(-2)^2}$

$= \frac{-3+\frac{1}{2}}{4} = \frac{-2.5}{4} = -\frac{5}{2} \cdot \frac{1}{4} = \boxed{-\frac{5}{8}}$

4) $\frac{d}{dx}(f(g(x)))$, evaluated at x = 3.

$= f'(g(x)) \cdot g'(x)$

$= f'(g(3))g'(3)$

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

$= \frac{1}{4} \cdot -3$

$= \boxed{-\frac{3}{4}}$

shell: $f(\ \ )$ $\}$ $f'(g(x$

choc. $g(x)$ $\}$ $g'(x$

$f'(g(x))g'(x$

Using the table, evaluate each of the following at x = -1.

x	f	f'	g	g'
-1	4	7	5	2
4	-2	3	-1	π

5) $\frac{d}{dx}(f+g)$

$f'(x)+g'(x)$

$f'(-1)+g'(-1)$

$7+2$

9

6) $\frac{d}{dx}\left(\frac{f}{g}\right)$

$\frac{g(x)f'(x)-f(x)g'(x)}{[g(x)]^2}$

$\frac{g(-1)f'(-1)-f(-1)g'(-1)}{[g(-1)]^2}$

$\frac{(5)(7)-(4)(2)}{25}=\frac{35-8}{25}=\frac{27}{25}$

7) $\frac{d}{dx}(f\cdot g)$

$f(x)g'(x)+f'(x)g(x)$

$f(-1)g'(-1)+f'(-1)g(-1)$

$(4)(2)+(7)(5)$

$8+35$

43

8) $\frac{d}{dx}((f)^2)$

$(\quad)^2 \quad 2(f(x))$

$f(x) \quad f'(x)$

$2f(x)f'(x)$

$2f(-1)f'(-1)$

$2(4)(7)=56$

9) $\frac{d}{dx}\left(\sqrt{f+g}\right)$ $\quad (f(x)+g(x))^{\frac{1}{2}}$

$(\quad)^{\frac{1}{2}} \quad \frac{1}{2}(f(x)+g(x))^{-\frac{1}{2}}$

$f(x)+g(x) \quad f'(x)+g'(x)$

$\frac{1}{2}[f'(x)+g'(x)](f(x)+g(x))^{-\frac{1}{2}}$

$\frac{f'(x)+g'(x)}{2\sqrt{f(x)+g(x)}}$

$\frac{f'(-1)+g'(-1)}{2\sqrt{f(-1)+g(-1)}}$

$\frac{7+2}{2\sqrt{4+5}}=\frac{9}{2\cdot 3}=\frac{9}{6}=\frac{3}{2}$

10) $\frac{d}{dx}\left(\frac{1}{f}\right)$ $\quad [f(x)]^{-1}$

$(\quad)^{-1} \quad -1(f(x))^{-2}$

$f(x) \quad f'(x)$

$\frac{-1\cdot f'(x)}{[f(x)]^2}$

$\frac{-1\cdot f'(-1)}{[f(-1)]^2}$

$\frac{-1(7)}{4^2}=\frac{-7}{16}$