$$\left[\begin{array}{c}3.6\\ \text{Solutions}\end{array}\right]$$

1. $\frac{dy}{dx} = 2\left(\frac{\sin x}{1+\cos(2x)}\right) \cdot \left[\frac{(1+\cos(2x))\cdot\cos x - \sin x(-\sin(2x))\cdot 2}{[1+\cos(2x)]^2}\right]$

2. $\frac{dy}{dx} = x^3 \cdot 4(2x-5)^3 \cdot 2 + (2x-5)^4 \cdot 3x^2$

3. $\frac{dy}{dx} = \sin^3 x \sec^2(4x)\cdot 4 + \tan(4x)\cdot 3\sin^2 x(\cos x)$

4. $\frac{dy}{dx} = 3(1+\cos^2(7x))^2 \cdot 2\cos(7x)(-\sin(7x))\cdot 7$

5. $\frac{dy}{dx} = \frac{1}{2}(\tan(5x))^{-1/2} \cdot \sec^2(5x) \cdot 5$

6. $\frac{dy}{dx} = 2(x-\sin(3x))\cdot(1-\cos(3x)\cdot 3)$

7. $\frac{dy}{dx} = -2(2x+\sqrt{x})^{-3}(2+\frac{1}{2}x^{-1/2})$

8. $\frac{d}{dx}\left[\frac{1}{g^2(x)}\right] = -2[g(x)]^{-3}\cdot g'(x)$

9. $\frac{d}{dx}[f(g(x)+x)] = f'(g(x)+x)[g'(x)+1]$

10. $\frac{d}{dx}\left[\sqrt{f^2(x)+g^2(x)}\right] = \frac{1}{2}(f^2(x)+g^2(x))^{-1/2}\cdot[2f(x)f'(x)+2g(x)\cdot g'(x)]$

11. $\frac{d}{dx}[f(x)\cdot g^3(x)] = f(x)\cdot 3g^2(x)\cdot g'(x) + g^3(x)\cdot f'(x)$

12. $\frac{d}{dx}\left[\frac{f^2(x)}{3x-g(h(x))}\right] = \frac{(3x-g(h(x)))\cdot 2f(x)f'(x) - f^2(x)[3-g'(h(x))\cdot h'(x)]}{[3x-g(h(x))]^2}$

BC.Q102.L3."CHART PRACTICE" HW SOLUTIONS

#1.

x	f	f'	g	g'	h	h'
0	2	11	-2	7	6	5
1	-4	5	5	8	-1/2	3
2	1	3	6	-1	0	4
6	-10	1/2	3	10	3/2	0

A. Find $[f(x)+3g(x)]'$ at $x=2$. $[f(x)+3g(x)]' = f'(x)+3g'(x)$

AT $x=2$: $f'(2)+3g'(2) = 3+3(-1) = \boxed{0}$

B. Find $[f(g(x))]'$ at $x=2$. $[f(g(x))]' = f'(g(x))\cdot g'(x)$

AT $x=2$: $f'(g(2))\cdot g'(2) = f'(6)\cdot(-1)$

$= \frac{1}{2}(-1) = \boxed{-\frac{1}{2}}$

C. Find $[f(2x-g(h(x))]'$ at $x=2$.

$[f(2x-g(h(x))]' = f'(2x-g(h(x)))\cdot[2-g'(h(x))\cdot h'(x)]$

$x=2$: $f'(4-g(h(2)))\cdot(2-g'(h(2))\cdot h'(2))$

$f'(4-g(0))\cdot(2-g'(0)\cdot 4)$

$f'(4-(-2))\cdot(2-7\cdot 4)$

$f'(6)\cdot(-26)$

$\frac{1}{2}\cdot -26$

$\boxed{-13}$

#2.

x	f	f'	g	g'
2	8	1/3	2	-3
3	3	2π	-4	5

A. Find $[f(g(x))]'$ at $x = 2$

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

AT $x = 2$: $f'(g(2)) \cdot g'(2) = f'(2) \cdot (-3) = \frac{1}{3} \cdot -3 = \boxed{-1}$

B. Find $\left[\sqrt{f(x)}\right]'$ at $x = 2$

$$\left[\sqrt{f(x)}\right]' = \frac{1}{2}[f(x)]^{-1/2} \cdot f'(x)$$

AT $x = 2$: $\frac{1}{2}(f(2))^{-1/2} \cdot f'(2) = \frac{1}{2} \frac{1}{\sqrt{8}} \cdot \frac{1}{3} = \boxed{\frac{1}{6\sqrt{8}}}$

C. Find $\left[\frac{1}{g^2(x)}\right]'$ at $x = 3$

$$\left[\frac{1}{g^2(x)}\right]' = -2[g(x)]^{-3} \cdot g'(x)$$

AT $x = 3 = -2[g(3)]^{-3} \cdot g'(3) = -2 \frac{1}{-64} \cdot 5 = \frac{-10}{-64} = \boxed{\frac{5}{32}}$

D. Find $\left[\sqrt{f^2(x) + g^2(x)}\right]'$ at $x = 2$

$$\left[\sqrt{f^2(x) + g^2(x)}\right]' = \frac{1}{2}(f^2(x) + g^2(x))^{-1/2} \cdot [2f(x)f'(x) + 2g(x) \cdot g'(x)]$$

AT $x = 2$: $\frac{1}{2}(64 + 4)^{-1/2} \cdot \left[2 \cdot 8 \cdot \frac{1}{3} + 2 \cdot 2 \cdot (-3)\right]$

$$= \frac{1}{2} \frac{1}{\sqrt{68}} \cdot \left[\frac{16}{3} - 12\right] = \boxed{\frac{-10}{3\sqrt{68}}}$$

#3.

x	f	f'	g	g'
0	1	5	1	1/3
1	3	-1/3	-4	-8/3

A. Find $[f(g(x))]'$ at $x=0$ $\quad [f(g(x))]' = f'(g(x))\cdot g'(x)$

AT $x=0$: $f'(g(0))\cdot g'(0) = f'(1)\cdot\frac{1}{3} = -\frac{1}{3}\cdot\frac{1}{3} = \boxed{-\frac{1}{9}}$

B. Find $\left[(g(x)+f(x))^{-2}\right]'$ at $x=1$ $\quad \left[(g(x)+f(x))^{-2}\right]' = -2\left(g(x)+f(x)\right)^{-3}[g'(x)+f'(x)]$

AT $x=1$: $-2\left(g(1)+f(1)\right)^{-3}[g'(1)+f'(1)]$

$= -2(-4+3)^{-3}\left[\frac{-8}{3}+\frac{-1}{3}\right] = -2(-1)^{-3}\left(\frac{-9}{3}\right) = \boxed{-6}$

C. Find $[f(x)g^3(x)]'$ at $x=0$ $\quad [f(x)g^3(x)]' = f(x)\cdot 3g^2(x)\cdot g'(x) + g^3(x)f'(x)$

AT $x=0$: $f(0)\cdot 3(g(0))^2\cdot g'(0) + g^3(0)f'(0)$

$= 1\cdot 3\cdot 1\cdot \frac{1}{3} + 1\cdot 5 = 1+5 = \boxed{6}$

D. Find $\left[\frac{f(x)}{g(x)+1}\right]'$ at $x=1$ $\quad \left[\frac{f(x)}{g(x)+1}\right]' = \frac{(g(x)+1)f'(x) - f(x)g'(x)}{[g(x)+1]^2}$

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

$= \frac{-3\cdot\frac{-1}{3} - 3\left(\frac{-8}{3}\right)}{(-3)^2} = \frac{1+8}{9} = \boxed{1}$