

6. (12 points) Suppose f and g are differentiable functions with values given by the table below. **To receive full credit, for each part below first show the formula for the derivative in terms of x , and then find the requested value.**

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	6	9	14	-7
2	4	13	1	-11

- (a) If $h(x) = f(x)g(x)$, find $h'(1)$.

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

$$\Rightarrow h'(1) = f'(1)g(1) + f(1)g'(1) = (14)(9) + (6)(-7) = 84$$

- (b) If $j(x) = \frac{\ln(x)}{f(x)}$, find $j'(1)$

$$j'(x) = \frac{\frac{f(x)}{x} - \ln(x)f'(x)}{(f(x))^2}$$

$$\Rightarrow j'(1) = \frac{\frac{1}{1}f(1) - \ln(1)f'(1)}{(f(1))^2} = \frac{1}{6}$$

- (c) If $d(x) = \sin(\cos(f(x)))$, find $d'(1)$.

$$d'(x) = \cos(\cos(f(x)))(-\sin(f(x)))f'(x)$$

$$\Rightarrow d'(1) = \cos(\cos(f(1)))(-\sin(f(1)))f'(1) \approx 2.243$$

- (d) If $t(x) = g(x)g(2x)$, find $t'(1)$.

$$t'(x) = g'(x)g(2x) + g(x)g'(2x)(2)$$

$$\Rightarrow t'(1) = g'(1)g(2) + 2(g(1)g'(2)) = -289$$