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Suppose that functions f and g and their derivatives have the following values at x = 2 and x = 3.

x	f(x)	g(x)	$f'(x)$	$g'(x)$
2	8	2	1/3	-3
3	3	-4	2π	5

Evaluate the derivatives with respect to x

A) $2f(x)$ at $x=2$

$$\frac{d}{dx}\left(2f(x)\right) = 2f'(x) + f(x)(0)$$
$$= 2f'(2)$$
$$= 2\left(\frac{1}{3}\right)$$
$$= \frac{2}{3}$$

B) $f(x)+g(x)$ at $x=3$

$$\frac{d}{dx}\left(f(x)+g(x)\right) =$$
$$f'(x)+g'(x)$$
$$f'(3)+g'(3)$$
$$2\pi + 5$$

C) $f(x)g(x)$ at $x=3$

$$f(x)\cdot g'(x) + g(x)\cdot f'(x)$$
$$f(3)\cdot g'(3) + g(3)\cdot f'(3)$$
$$(3)(5) + (-4)(2\pi)$$
$$15 - 8\pi$$

D) $\dfrac{f(x)}{g(x)}$ at $x=2$

$$\frac{g(x)\cdot f'(x) - f(x)\cdot g'(x)}{[g(x)]^2}$$
$$\frac{(2)\left(\frac{1}{3}\right) - (8)(-3)}{2^2}$$
$$\frac{(3)\frac{2}{3} + 24(3)}{4(3)} = \frac{2+72}{12}$$
$$= 74/12$$

E) $f(g(x))$ at $x=2$

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

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

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

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

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

$$-1$$

F) $\sqrt{f(x)}$ at $x=2$

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

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

G) $\frac{1}{g^2(x)}$ at $x=3$

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

$$\frac{d}{dx}\left[[f(x)]^2\right]$$

$$2f(x)\cdot f'(x)$$

F) $\sqrt{f^2(x)+g^2(x)}$ at $x=2$

$$\frac{d}{dx}\left(\left[f^2(x)+g^2(x)\right]^{1/2}\right)$$

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

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