Name: Richard

QUIZ 8

MATH 200

September 16, 2025

1. Suppose $y = \dfrac{\cos(x)+1}{x^2}$. Find $\dfrac{dy}{dx} = \dfrac{(-\sin(x)+0)x^2 - (\cos(x)+1)2x}{(x^2)^2}$

$$= \frac{-x^2\sin(x) - (\cos(x)+1)2x}{x^4} = \frac{x(-x\sin(x)) - 2(\cos(x)+1)}{x^4}$$

$$= \boxed{\frac{-x\sin(x) - 2\cos(x) - 2}{x^3}}$$

2. Suppose $f(x) = \sin(x)(x^3 - 4x^2)$. Find $f'(x)$.

$$f'(x) = \boxed{\cos(x)(x^3-4x^2) + \sin(x)(3x^2-8x)}$$

3. Suppose $y = \dfrac{xe^x}{1+x^2}$. Find y'. $= \dfrac{D_x[xe^x](1+x^2) - xe^x(0+2x)}{(1+x^2)^2}$

$$= \boxed{\frac{(1\cdot e^x + xe^x)(1+x^2) - 2x^2e^x}{1+2x^2+x^4}} = \boxed{\frac{e^x(1+x)(1+x^2) - 2x^2}{1+2x^2+x^4}}$$

4. Information about two functions f and g and their derivatives is given in the table below. Suppose $h(x) = x^3 + f(x)\cdot g(x)$. Find $h'(2)$.

x	1	2	3	4	5	6
$f(x)$	-3	-2	1	5	6	3
$f'(x)$	5	3	2	1	0	-2
$g(x)$	0	1	-2	3	-4	5
$g'(x)$	2	-3	5	-8	10	-15

$$h'(x) = 3x^2 + f'(x)g(x) + f(x)g'(x)$$

$$h'(2) = 3\cdot 2^2 + f'(2)g(2) + f(2)g'(2)$$

$$= 12 + 3\cdot 1 + (-2)(-3)$$

$$= 12 + 3 + 6 = \boxed{21}$$

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1. Suppose $f(x) = x^3 \cos(x)$. Find $f'(x)$.

$$f'(x) = 3x^2 \cos(x) + x^3(-\sin(x))$$
$$= \boxed{3x^2\cos(x) - x^3 \sin(x)}$$

2. Suppose $y = \frac{e^x + x}{\sin(x)}$. Find $\frac{dy}{dx}$ $= D_x\left[\frac{e^x + x}{\sin(x)}\right] = \boxed{\frac{(e^x+1)\sin(x) - (e^x+x)\cos(x)}{\sin^2(x)}}$

3. Suppose $y = \frac{1+x^2}{xe^x}$. Find y'. $= D_x\left[\frac{1+x^2}{xe^x}\right] = \frac{D_x[1+x^2]xe^x - (1+x^2)D_x[xe^x]}{(xe^x)^2}$

$$= \frac{2x\,xe^x - (1+x^2)(1e^x + xe^x)}{x^2e^{2x}} = \boxed{\frac{2x^2e^x - (1+x^2)(e^x+xe^x)}{x^2e^{2x}}}$$

$$= \frac{e^x(2x^2 - (1+x^2)(1+x))}{x^2e^xe^x} = \boxed{\frac{2x^2 - (1+x^2)(1+x)}{x^2e^x}}$$

4. Information about two functions f and g and their derivatives is given in the table below.
Suppose $h(x) = f(x) + x^2 g(x)$. Find $h'(3)$.

x	1	2	3	4	5	6
$f(x)$	−3	−2	1	5	6	3
$f'(x)$	5	3	2	1	0	−2
$g(x)$	0	1	−2	3	−4	5
$g'(x)$	2	−3	5	−8	10	−15

$$h'(x) = f'(x) + 2x\,g(x) + x^2 g'(x)$$
$$h'(3) = f'(3) + 2\cdot 3\,g(3) + 3^2 g'(3)$$
$$= 2 + 2\cdot 3(-2) + 9\cdot 5$$
$$= 2 - 12 + 45 = \boxed{35}$$