Name: Richard

QUIZ 8 ♡

MATH 200
February 10, 2026

1. Suppose $f(x) = \sin(x) + \cot(x)$. Find $f'(x)$.

$$\boxed{f'(x) = \cos(x) - \csc^2(x)}$$

2. Suppose $y = (x^5 - 4x)\, e^x$. Find $\frac{dy}{dx} = (5x^4 - 4)\, e^x + (x^5 - 4x)\, e^x$

$$= (5x^4 - 4 + x^5 - 4x)\, e^x$$

$$= \boxed{(x^5 + 5x^4 - 4x - 4)\, e^x}$$

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

$$= \frac{0(1+\tan(x)) - (0 + \sec^2(x))}{(1+\tan(x))^2} = \boxed{\frac{-\sec^2(x)}{(1+\tan(x))^2}}$$

4. Information about functions f and g and their derivatives are given in the table below.

Suppose $h(x) = x^2 f(x) + g(x)$. 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

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

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

$$= 4 \cdot (-2) + 4 \cdot 3 + (-3)$$

$$= -8 + 12 - 3 = \boxed{1}$$

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

$$\boxed{f'(x) = 3x^2 \tan(x) + x^3 \sec^2(x)}$$

2. Suppose $y = \dfrac{x^2 - 5x + 4}{x^2 - 24}$. Find $\dfrac{dy}{dx}$.

$$\frac{dy}{dx} = \frac{(2x-5)(x^2-24) - (x^2-5x+4)2x}{(x^2-24)^2}$$

$$= \frac{2x^3 - 48x - 5x^2 + 120 - 2x^3 + 10x^2 - 8x}{(x^2-24)^2} = \boxed{\frac{5x^2 - 56x + 120}{(x^2-24)^2}}$$

3. Suppose $y = \dfrac{1 + xe^x}{\sin(x)}$. Find y'.

$$y' = \frac{D_x[1 + xe^x]\sin(x) - (1 + xe^x)D_x[\sin(x)]}{\sin^2(x)}$$

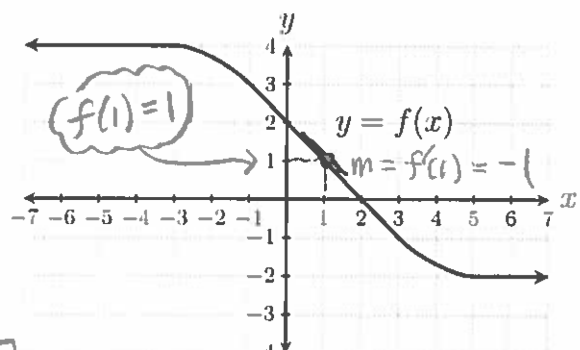
$$= \boxed{\frac{(e^x + xe^x)\sin(x) - (1 + xe^x)\cos(x)}{\sin^2(x)}}$$

4. A function $f(x)$ is graphed below. Suppose $g(x) = f(x) \cdot e^x$. Find $g'(1)$.

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

(product rule)

$$g'(1) = f'(1)e^1 + f(1)e^1$$
$$= (-1)e^1 + 1 \cdot e^1 = \boxed{0}$$



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1. Suppose $f(x) = e^x\sqrt{x}$. Find $f'(x)$.

$$f(x) = e^x x^{\frac{1}{2}}$$

$$f'(x) = e^x\sqrt{x} + e^x \tfrac{1}{2}x^{\frac{1}{2}-1} = \boxed{e^x\sqrt{x} + \frac{e^x}{2\sqrt{x}}}$$

2. Suppose $y = \dfrac{3x^2+2}{x-1}$. Find $\dfrac{dy}{dx}$.

$$\frac{dy}{dx} = \frac{6x(x-1) - (3x^2+2)(1)}{(x-1)^2} = \frac{6x^2-6x-3x^2-2}{(x-1)^2} = \boxed{\frac{3x^2-6x-2}{(x-1)^2}}$$

3. Suppose $y = \dfrac{x^2+1}{x\cos(x)}$. Find y'.

Start with quotient rule

Need product rule here

$$y' = \frac{D_x[x^2+1]\, x\cos(x) - (x^2+1)\, D_x[x\cos(x)]}{(x\cos(x))^2}$$

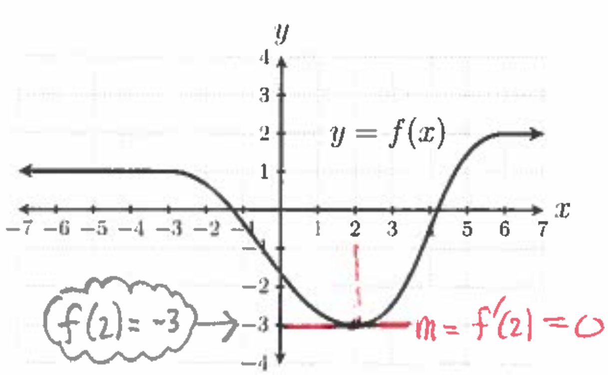
$$= \boxed{\frac{2x^2\cos(x) - (x^2+1)(1\cdot\cos(x) - x\sin(x))}{(x\cos(x))^2}}$$

4. A function $f(x)$ is graphed below. Suppose $g(x) = \dfrac{f(x)}{2x+1}$. Find $g'(2)$.

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

$$g'(2) = \frac{f'(2)(2\cdot2+1) - f(2)\cdot 2}{(2\cdot2+1)^2}$$

$$= \frac{0\cdot5 - (-3)(2)}{5^2} = \boxed{\frac{6}{25}}$$



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1. Suppose $f(x) = \sec(x) + \tan(x)$. Find $f'(x)$.

$$\boxed{f'(x) = \sec(x)\tan(x) + \sec^2(x)}$$

2. Suppose $y = x^3\cos(x)$. Find $\frac{dy}{dx}$. $= 3x^2\cos(x) + x^3(-\sin(x))$

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

3. Suppose $y = \frac{1}{x^2e^x}$. Find y'. $= \frac{D_x[1]x^2e^x - 1\cdot D_x[x^2e^x]}{(x^2e^x)^2}$

$$= \frac{0\cdot x^2e^x - (2xe^x + x^2e^x)}{x^4(e^x)^2} = \frac{-e^x(2x + x^2)}{x^4e^xe^x}$$

$$= \boxed{\frac{-2x - x^2}{x^4e^x}} = \boxed{\frac{-2-x}{x^3e^x}}$$

4. Information about functions f and g and their derivatives are given in the table below.

Suppose $h(x) = \frac{f(x)}{x + g(x)}$. 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

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

$$h'(2) = \frac{f'(2)(2+g(2)) - f(2)(1+g'(2))}{(2+g(2))^2}$$

$$= \frac{3(2+1) - (-2)(1+(-3))}{(2+1)^2} = \frac{9-(-2)(-2)}{9} = \boxed{\frac{5}{9}}$$