Name: Richard | Quiz 8 ♡ | MATH 200
September 28, 2022

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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QUIZ 8 ♣

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

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

2. Suppose $y = (e^x + 1)(x^2 - 5x + 4)$. Find $\frac{dy}{dx}$.

$$\frac{dy}{dx} = (e^x + 0)(x^2 - 5x + 4) + (e^x + 1)(2x - 5)$$

$$= \boxed{e^x(x^2 - 5x + 4) + (e^x + 1)(2x - 5)}$$

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

$$D_x\left[\frac{xe^x}{\sin(x)}\right] = \frac{D_x[xe^x]\sin(x) - xe^x D_x[\sin(x)]}{(\sin(x))^2}$$

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

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

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

Suppose $h(x) = \frac{1 + f(x)}{g(x)}$. 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

$$h'(x) = \frac{(0 + f'(x))g(x) - (1 + f(x))g'(x)}{(g(x))^2}$$

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

$$h'(2) = \frac{f'(2)g(2) - (1 + f(2))g'(2)}{g(2)^2} = \frac{3(1) - (1 + (-2))(-3)}{1^2}$$

$$= \frac{3 - 3}{1} = \boxed{0}$$

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QUIZ 8 ◊

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

$$f'(x) = \sec(x)\tan(x) + (-\sin(x)) = \boxed{\sec(x)\tan(x) - \sin(x)}$$

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

$$D_x\left[\sin(x)(3x^2+2)\right] = \cos(x)(3x^2+2) + \sin(x)(6x+0)$$

$$= \boxed{\cos(x)(3x^2+2) + 6x\sin(x)}$$

3. Suppose $y = \frac{x + \tan(x)}{x^5 + 1}$. Find y'. $D_x\left[\frac{x+\tan(x)}{x^5+1}\right]$

$$= \frac{D_x[x+\tan(x)](x^5+1) - (x+\tan(x))5x^4}{(x^5+1)^2}$$

$$= \boxed{\frac{(1+\sec^2(x))(x^5+1) - (x+\tan(x))5x^4}{(x^5+1)^2}}$$

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

Suppose $h(x) = \frac{f(x)}{5g(x)}$. 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

$$h'(x) = \frac{f'(x)\,5g(x) - f(x)\,5g'(x)}{(5g(x))^2}$$

$$h'(3) = \frac{f'(3)\cdot 5g(3) - f(3)\,5g'(3)}{(5g(3))^2}$$

$$= \frac{2\cdot 5\cdot(-2) - 1\cdot 5\cdot 5}{25\cdot(-2)^2} = \frac{-20-25}{100} = \frac{-45}{100} = \boxed{\frac{-9}{20}}$$

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QUIZ 8 ♠

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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 $y = \frac{1}{x^2 e^x}$. 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

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

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

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