Name: Richard

QUIZ 8 ♡

MATH 200
September 27, 2021

1. Suppose $f(x) = x^2\cos(x)$. Find $f'(x)$.

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

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

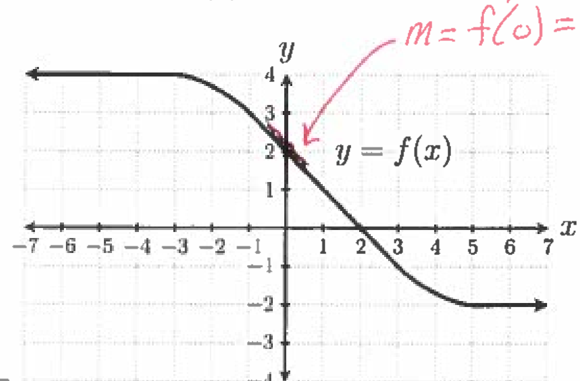
$$\frac{dy}{dx} = \frac{2x(x^2-5x+4) - (x^2-24)(2x-5)}{(x^2-5x+4)^2}$$
$$= \frac{2x^3 - 10x^2 + 8x - (2x^3 - 5x^2 - 48x + 120)}{(x^2-5x+4)^2} = \boxed{\frac{-5x^2+56x-120}{(x-5x+4)^2}}$$

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

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

4. A function $f(x)$ is graphed below. Suppose $g(x) = f(x)\cdot e^x$. Find $g'(0)$.

$m = f'(0) = -1$



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

$$g'(0) = f'(0)e^0 + f(0)e^0$$
$$= (-1)\cdot 1 + 2\cdot 1 = \boxed{1}$$

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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'.

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

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

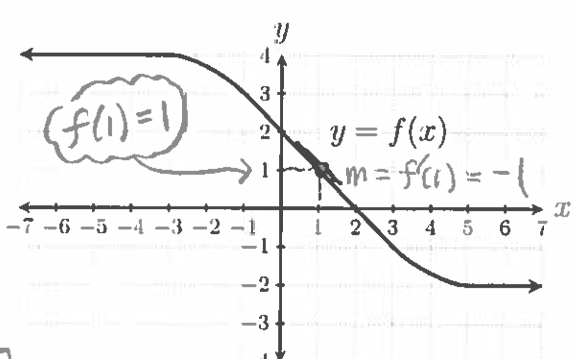
4. A function $f(x)$ is graphed below. Suppose $g(x) = f(x) \cdot e^x$. Find $g'(1)$.

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

(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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QUIZ 8 ◊

MATH 200

September 27, 2021

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

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

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

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

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

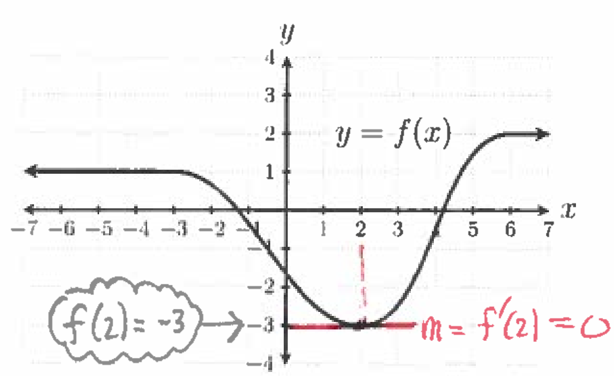
$$= \boxed{\frac{2x^2\cos(x) - (x^2+1)(1\cdot\cos(x) - x\sin(x))}{(x\cos(x))^2}}$$

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

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

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

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



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QUIZ 8 ♠

MATH 200
September 27, 2021

1. Suppose $f(x) = x^5 \sec(x)$. Find $f'(x)$.

$$\boxed{f'(x) = 5x^4 \sec(x) + x^5 \sec(x)\tan(x)}$$

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

$$\frac{dy}{dx} = \frac{(2x-0)(x^2-5x+4) - (x^2-24)(2x-5)}{(x^2-5x+4)^2}$$

$$= \frac{2x^3 - 10x^2 + 8x - (2x^3 - 5x^2 - 48x + 120)}{(x^2-5x+4)^2} = \boxed{\frac{-5x^2 + 56x - 120}{(x^2-5x+4)^2}}$$

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

$$y' = \frac{D_x[x\sin(x)](1+3x) - x\sin(x)\, D_x[1+3x]}{(1+3x)^2}$$

$$= \boxed{\frac{(\sin(x) + x\cos(x))(1+3x) - 3x\sin(x)}{(1+3x)^2}}$$

4. A function $f(x)$ is graphed below. Suppose $g(x) = f(x)\cdot(2x+1)$. Find $g'(6)$.

$g'(x) = f'(x)(2x+1) + f(x)\cdot 2$

(product rule)

$g'(6) = f'(6)(2\cdot 6+1) + f(6)\cdot 2$

$= 0\cdot 13 + 2\cdot 2 = \boxed{4}$