Name: Richard

Quiz 8

MATH 200
September 17, 2024

1. Suppose $y = \dfrac{\tan(x)}{x}$. Find $\dfrac{dy}{dx} = \dfrac{\sec^2(x)\,x - \tan(x)\cdot 1}{x^2}$

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

2. Suppose $f(x) = e^x\sqrt{x}$. Find $f'(x) = e^x\sqrt{x} + e^x\,\frac{1}{2}x^{\frac{1}{2}-1}$

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

$$= e^x\sqrt{x} + e^x\frac{1}{2x^{1/2}}$$

$$= \boxed{e^x\left(\sqrt{x} + \frac{1}{2\sqrt{x}}\right)}$$

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

$$= \frac{(1\cdot\sin(x) + x\cos(x))(1+x^2) - x\sin(x)(0+2x)}{(1+x^2)^2}$$

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

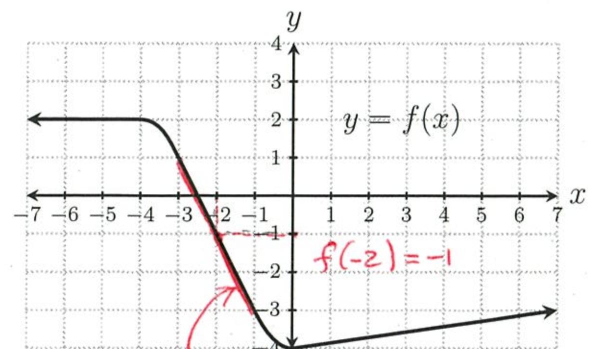
4. A function $f(x)$ is graphed below. Suppose $g(x) = x^2 f(x)$. Find $g'(-2)$.

$g'(x) = 2x\,f(x) + x^2 f'(x)$

$g'(-2) = 2(-2)f(-2) + (-2)^2 f'(-2)$

$= 2(-2)(-1) + 4(-2)$

$= 4 - 8 = \boxed{-4}$



$m = f'(-2) = -2$

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1. Suppose $f(x) = \sqrt{x}\,\tan(x)$. Find $f'(x)$. $= \frac{1}{2}x^{\frac{1}{2}-1}\tan x + \sqrt{x}\sec^2(x)$

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

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

$$= \boxed{\frac{\tan(x)}{2\sqrt{x}} + \sqrt{x}\sec^2(x)}$$

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

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

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

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

4. A function $f(x)$ is graphed below. Suppose $g(x) = x^3 f(x)$. Find $g'(-5)$.

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

$g'(-5) = 3(-5)^2 f(-5) + 5^3 f'(-5)$

$= 3\cdot 25\cdot 2 + 5^3\cdot 0$

$= \boxed{150}$