MA 16010: Quiz 6

9/26/2018

(1) (3 points) Find the derivative of $y = 6e^{2x}\cos(x^2+1)$.

Solution

Start with the product rule:

$$y' = 6\,\frac{d}{dx}\Big[e^{2x}\Big]\cos(x^2+1) \;+\; 6e^{2x}\,\frac{d}{dx}\Big[\cos(x^2+1)\Big]$$

Use the chain rule:

$$y' = 6\big(2e^{2x}\big)\cos(x^2+1) \;+\; 6e^{2x}\big(-\sin(x^2+1)\cdot 2x\big)$$

Then simplify:

$$\begin{aligned} y' &= 12e^{2x}\cos(x^2+1) \;-\; 12xe^{2x}\sin(x^2+1) \\ &= 12e^{2x}\Big(\cos(x^2+1) \;-\; x\sin(x^2+1)\Big) \end{aligned}$$

(2) (2 points) If $f^{(7)}(x) = \ln(5x^2)$, find $f^{(8)}(x)$. (Simplify!)

Solution

The 8th derivative is the derivative of the 7th derivative: $f^{(8)}(x) \;=\; \frac{d}{dx}\Big[f^{(7)}(x)\Big] = \frac{d}{dx}\Big[\ln(5x^2)\Big]$.

Use the chain rule:

$$\text{Inner function: } g(x) = u = 5x^2$$

$$\text{Outer function: } f(u) = \ln(u)$$

$$g'(x) = 10x, \quad f'(u) = \frac{1}{u}$$

$$\text{So: } \; f^{(8)}(x) \;=\; \frac{1}{5x^2}\cdot 10x \;=\; \frac{2}{x}\,.$$