MATH 200 – QUIZ 8 ♣

Name: Richard

March 5, 2015

1. Find the derivatives of the following functions.

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

(b) $y = (x + e^{6x})^9$ $\quad \frac{dy}{dx} = 9(x+e^{6x})^8 \frac{d}{dx}\left[x + e^{6x}\right] = \boxed{9(x+e^{6x})^8(1+6e^{6x})}$

2. Use implicit differentiation to find the slope of the tangent to the graph of $y = 2\sin(\pi x - y)$ at the point $(1, 0)$.

$y = 2\sin(\pi x - y)$ $\quad \{y = f(x)\}$

$\frac{d}{dx}[y] = \frac{d}{dx}\left[2\sin(\pi x - y)\right]$

$y' = 2\cos(\pi x - y)(\pi - y')$

$y' = 2\cos(\pi x - y)\pi - 2\cos(\pi x - y)y'$

$y' + 2\cos(\pi x - y)y' = 2\cos(\pi x - y)\pi$

$y'(1 + 2\cos(\pi x - y)) = 2\pi\cos(\pi x - y)$

$y' = \frac{2\pi\cos(\pi x - y)}{1 + 2\cos(\pi x - y)}$

$y'\Big|_{(1,0)} = \frac{2\pi\cos(\pi \cdot 1 - 0)}{1 + 2\cos(\pi \cdot 1 - 0)} = \frac{-2\pi}{1-2} = \boxed{2\pi}$

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1. Find the derivatives of the following functions.

(a) $f(x) = e^{x^2+3}$ $\quad f'(x) = e^{x^2+3}(2x + 0) = \boxed{2xe^{x^2+3}}$

(b) $y = (x + \cos(x^2))^9$ $\quad \frac{dy}{dx} = \boxed{9(x + \cos(x^2))^8(1 - \sin(x^2)\,2x)}$

2. Use implicit differentiation to find the slope of the tangent to the graph of $2xy + \pi\sin(y) = 2\pi$ at the point $(1, \pi/2)$.

$2xy + \pi\sin(y) = 2\pi$ $\quad \{y = f(x)\}$

$\frac{d}{dx}\left[2xy + \pi\sin(y)\right] = \frac{d}{dx}\left[2\pi\right]$

$2y + 2xy' + \pi\cos(y)y' = 0$

$y'(2x + \pi\cos(y)) = -2y$

$y' = \frac{-2y}{2x + \pi\cos(y)}$

$y'\Big|_{(1,\frac{\pi}{2})} = \frac{-2\frac{\pi}{2}}{2\cdot 1 + \pi\cos(\frac{\pi}{2})} = \frac{-\pi}{2 + \pi \cdot 0} = \boxed{-\frac{\pi}{2}}$