Name: Richard

MATH 200 – QUIZ 7 ☎

Instructions: Show your work neatly. You do not need to simplify your answers.

February 28, 2013

1. Find the derivative of $f(x) = (\cot(x))^{399}$

$$f'(x) = 399(\cot(x))^{398}\frac{d}{dx}[\cot(x)] = 399\cot^{398}(x)(-\csc^2(x))$$
$$= \boxed{-399\cot^{398}(x)\csc^2(x)}$$

2. $\frac{d}{dx}\left[\sqrt{\frac{\sin x}{x}}\right] = \frac{d}{dx}\left[\left(\frac{\sin x}{x}\right)^{\frac{1}{2}}\right] = \frac{1}{2}\left(\frac{\sin x}{x}\right)^{-1/2}\frac{\cos(x)\,x - \sin(x)(1)}{x^2}$

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

3. Let $f(x) = e^{\sqrt{\csc(x)}}$. Find $f'(x)$.

$$f'(x) = e^{\sqrt{\csc(x)}}\frac{d}{dx}\left[\sqrt{\csc(x)}\right] = e^{\sqrt{\csc(x)}}\frac{d}{dx}\left[(\csc(x))^{\frac{1}{2}}\right]$$
$$= e^{\sqrt{\csc(x)}}\frac{1}{2}(\csc(x))^{-\frac{1}{2}}(-\csc(x)\cot(x)) = \frac{e^{\sqrt{\csc(x)}}(-\csc(x)\cot(x))}{2\sqrt{\csc(x)}}$$
$$= \boxed{\frac{-e^{\sqrt{\csc(x)}}\csc(x)\cot(x)}{2\sqrt{\csc(x)}}}$$

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1. Find the derivative of $f(x) = \sec(6x^2 - x)$.

$$f'(x) = \sec(6x^2-x)\tan(6x^2-x)\frac{d}{dx}[6x^2 - x]$$
$$= \boxed{\sec(6x^2-x)\tan(6x^2-x)(12x-1)}$$

2. Let $f(x) = \sin(x)e^{x^2+1}$. Find $f'(x)$. (Use product rule first.)

$$f'(x) = \frac{d}{dx}[\sin(x)]e^{x^2+1} + \sin(x)\frac{d}{dx}[e^{x^2+1}]$$
$$= \cos(x)e^{x^2+1} + \sin(x)e^{x^2+1}(2x) = \boxed{e^{x^2+1}(\cos(x) + 2x\sin(x))}$$

3. $\frac{d}{dx}\left[\frac{x}{\sqrt{\cot(x)}}\right] = \frac{(1)\sqrt{\cot(x)} - x\frac{d}{dx}[\sqrt{\cot(x)}]}{(\sqrt{\cot(x)})^2}$

$$= \frac{\sqrt{\cot(x)} - x\frac{d}{dx}[(\cot(x))^{1/2}]}{\cot(x)} = \frac{\sqrt{\cot(x)} - x\frac{1}{2}(\cot(x))^{-\frac{1}{2}}\frac{d}{dx}[\cot(x)]}{\cot(x)}$$

$$= \frac{\sqrt{\cot(x)} - \frac{x}{(\cot(x))^{1/2}}(-\cot(x)\csc(x))}{\cot(x)} = \boxed{\frac{\sqrt{\cot(x)} + \frac{x\cot(x)\csc(x)}{\sqrt{\cot(x)}}}{\cot(x)}}$$

Name: Richard

MATH 200 – QUIZ 7 ✉

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February 28, 2013

1. $\frac{d}{dx}\left[\sin\left(e^{5x}\right)\right] = \cos\left(e^{5x}\right)\frac{d}{dx}\left[e^{5x}\right] = \cos\left(e^{5x}\right)e^{5x}\frac{d}{dx}[5x] = \cos\left(e^{5x}\right)e^{5x}\cdot 5$

$= \boxed{5\cos\left(e^{5x}\right)e^{5x}}$

2. Find the derivative of $f(x) = \left(67x + x^{-2}\right)^{216}$.

$f'(x) = 217\left(67x + x^{-2}\right)^{216}\frac{d}{dx}\left[67x + x^{-2}\right] = \boxed{217\left(67x + x^{-2}\right)^{216}\left(67 - 2x^{-3}\right)}$

3. Let $f(x) = \cos(x)\sin\left(\sqrt{x}\right)$. Find $f'(x)$. $f'(x) = \frac{d}{dx}[\cos(x)]\sin(\sqrt{x}) + \cos(x)\frac{d}{dx}\left[\sin\left(x^{1/2}\right)\right]$

$= -\sin(x)\sin(\sqrt{x}) + \cos(x)\cos\left(x^{1/2}\right)\frac{d}{dx}\left[x^{1/2}\right]$

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

Name: R. chard

MATH 200 – QUIZ 7 🔊

Instructions: Show your work neatly. You do not need to simplify your answers.

February 28, 2013

1. Find the derivative of $f(x) = \csc\left(\pi^2 x\right)$. $f'(x) = -\csc\left(\pi^2 x\right)\cot\left(\pi^2 x\right)\frac{d}{dx}\left[\pi^2 x\right]$

$= -\csc\left(\pi^2 x\right)\cot\left(\pi^2 x\right)\pi^2 = \boxed{-\pi^2\csc\left(\pi^2 x\right)\cot\left(\pi^2 x\right)}$

2. Let $f(x) = e^{(16x^2 - 17x)}$. Find $f'(x)$. $f'(x) = e^{16x^2-17x}\frac{d}{dx}\left[16x^2 - 17x\right]$

$= \boxed{e^{16x^2-17x}(32x - 17)}$

3. $\frac{d}{dx}\left[\frac{1}{\cos^2(3x)}\right] = \frac{d}{dx}\left[\left(\cos^2(3x)\right)^{-1}\right] = \frac{d}{dx}\left[\left(\cos(3x)\right)^{-2}\right] = -2\left(\cos(3x)\right)^{-3}\frac{d}{dx}[\cos(3x)]$

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

Alternatively, we could use the quotient rule:

$\frac{d}{dx}\left[\frac{1}{\cos^2(3x)}\right] = \frac{(0)\cos^2(3x) - 1\cdot 2\cos(3x)(-\sin(3x))3}{\left(\cos^2(3x)\right)^2} = \frac{6\cos(3x)\sin(3x)}{\cos^4(3x)}$

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