Rules to differentiate trigonometric functions:

Given that "u" represents some differentiable function...

$$\frac{d}{du}(\sin u) = \cos u \bullet du \qquad \frac{d}{du}(\csc u) = -\csc u \cot u \bullet du$$

$$\frac{d}{du}(\cos u) = -\sin u \bullet du \qquad \frac{d}{du}(\sec u) = \sec u \tan u \bullet du$$

$$\frac{d}{du}(\tan u) = \sec^2 u \bullet du \qquad \frac{d}{du}(\cot u) = -\csc^2 u \bullet du$$

Differentiate each of the following:

1. $f(x) = \cos\sqrt{5x-1} + \tan x^3$

$f'(x) = -\sin\sqrt{5x-1}\left(\frac{1}{2}(5x-1)^{-1/2}(5)\right) + \sec^2 x^3 (3x^2)$

2. $y = \dfrac{\sec(5x)}{\cot\sqrt{x}}$

$y' = \dfrac{\left[\sec 5x \tan 5x\,(5)\right]\cot\sqrt{x} - \sec(5x)\left[-\csc^2\sqrt{x}\left(\frac{1}{2}x^{-\frac{1}{2}}\right)\right]}{\cot^2\sqrt{x}}$

3. $f(x) = \csc^2\sqrt{x} - \sqrt{\sin(9x^6)}$

$f'(x) = 2(\csc\sqrt{x})^1(-\csc\sqrt{x}\cot\sqrt{x})\left(\frac{1}{2}x^{-\frac{1}{2}}\right) - \frac{1}{2}(\sin(9x^6))^{-1/2}(\cos(9x^6))(54x^5)$

4. $f(x) = \tan\left[\cos\left(8x^{-3}\right)\right]$ u $F(x$

$f'(x) = \sec^2\left[\cos(8x^{-3})\right]\left[-\sin(8x^{-3})(-24x^{-4})\right]$

5. $f(x) = \sin\left\{\cos\left[\tan^3(7x)\right]\right\}$ $[\tan(7x)]^3$

$f'(x) = \cos\left[\cos(\tan 7x)^3\right]\left[-\sin(\tan 7x)^3\left[3(\tan 7x)^2(\sec^2 7x)(7)\right]\right]$

6. $y = \dfrac{(6x^3)\sqrt{5\cot\sqrt{x} + \cos^3 3x}}{\tan\left(\sin\sqrt[3]{x}\right) + 8\cot x^7 - \csc\left(x^4 - 1\right)^5}$

$y' = \left[18x^2\sqrt{5\cot\sqrt{x} + \cos^3 3x} + (6x^3)\left[\frac{1}{2}\left(5\cot\sqrt{x} + \cos^3 3x\right)^{-1/2}\left(-5\csc^2\sqrt{x}\left(\frac{1}{2}x^{-1/2}\right) + 3(\cos 3x)^2(-\sin 3x)(3)\right)\right]\right]\left[\tan(\sin^3\sqrt{x}) + 8\cot x^7 - \csc(x^4-1)^5\right]$

$- \left[(6x^3)\sqrt{5\cot\sqrt{x} + \cos^3 3x}\right]\left[\sec^2(\sin\sqrt{x})^3\,3(\sin\sqrt{x})^2\cos\sqrt{x}\left(\frac{1}{2}x^{-1/2}\right) + -8\csc^2 x^7(7x^6) + \csc(x^4-1)^5\cot(x^4-1)^5\,5(x^4-1)^4(4x^3)\right]$

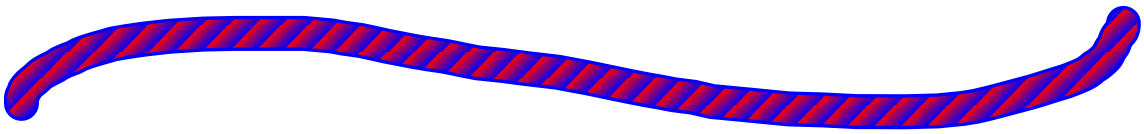
$\left[\tan(\sin^3\sqrt{x}) + 8\cot x^7 - \csc(x^4-1)^5\right]^2$

$$f(x) = \sin(\underbrace{\cot(7x^8)}_{\text{"u"}})$$

$$f'(x) = \cos(\underbrace{\cot(7x^8)}_{u})\left(-\csc^2(7x^8)(56x^7)\right)$$

Homework

Worksheet on derivatives of trigonometric functions



Attachments

Worksheet - Intro. to Average Rate of Change.doc

Derivatives Worksheet.doc