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Encontrar $f'(x)$

1: $f(x) = \cos 2x - 2\operatorname{sen} x$

$$f(x) = \cos^2 x - \operatorname{sen}^2 x - 2\operatorname{sen} x$$

$$\Rightarrow f'(x) = -2\cos x \operatorname{sen} x - 2\operatorname{sen} x (+\cos x) - 2\cos x$$

$$= -2\cos x \operatorname{sen} x - 2\operatorname{sen} x \cos x - 2\cos x$$

$$= -4\cos x \operatorname{sen} x - 2\cos x$$

$$= -2\cos x - 4\operatorname{sen} x \cos x$$

$$\Rightarrow f'(x) = -2\cos(1 + 2\operatorname{sen} x)$$

2: $f(x) = \sqrt{1+x^2}$

$$\Rightarrow f'(x) = \frac{1}{2} \cdot \frac{2x}{\sqrt{1+x^2}} = \frac{x}{\sqrt{1+x^2}}$$

3: $f(x) = (2-x^2)\cos x^2 + 2x\operatorname{sen} x^3$

$$f(x) = 2\cos x^2 - x^2\cos x^2 + 2x\operatorname{sen} x^3$$

$$\Rightarrow f'(x) = 2(-\operatorname{sen} x^2)(2x) - \left[2x\cos x^2 + x^2(-\operatorname{sen} x^2)(2x)\right] + \left[2\operatorname{sen} x^3 + 2x\cos x^3(3x^2)\right]$$

$$= -4x\operatorname{sen} x^2 - 2x\cos x^2 + 2x^3\operatorname{sen} x^2 + 2\operatorname{sen} x^3 + 6x^3\cos x^3$$

$$f'(x) = (2x^3 - 4x)\operatorname{sen} x^2 - 2x\cos x^2 + 2\operatorname{sen} x^3 + 6x^3\cos x^3$$

4: $f(x) = \operatorname{sen}(\cos^2 x) \cdot \cos(\operatorname{sen}^2 x)$

$$\Rightarrow f'(x) = \Big[\cos(\cos^2 x)(2\cos x)(-\operatorname{sen} x) \cdot \cos(\operatorname{sen}^2 x) + \operatorname{sen}(\cos^2 x) \cdot \{-\operatorname{sen}(\operatorname{sen}^2 x)(2\operatorname{sen} x)(\cos x)\}\Big]$$

$$= -2\operatorname{sen} x\cos x \cos(\cos^2 x)\cos(\operatorname{sen}^2 x) - 2\operatorname{sen} x\cos x \operatorname{sen}(\cos^2 x)\operatorname{sen}(\operatorname{sen}^2 x)$$

$$= -\operatorname{sen} 2x \cos(\cos^2 x)\cos(\operatorname{sen}^2 x) - \operatorname{sen} 2x \operatorname{sen}(\cos^2 x)\operatorname{sen}(\operatorname{sen}^2 x)$$

$$f'(x) = -\operatorname{sen} 2x\left[\cos(\cos^2 x)\cos(\operatorname{sen}^2 x) + \operatorname{sen}(\cos^2 x)\operatorname{sen}(\operatorname{sen}^2 x)\right]$$

6: $f(x) = \operatorname{sen}[\operatorname{sen}(\operatorname{sen} x)]$

$$\Rightarrow f'(x) = \cos[\operatorname{sen}(\operatorname{sen} x)] \cdot \cos(\operatorname{sen} x) \cdot \cos x$$

$$f'(x) = \cos x \cos(\operatorname{sen} x)\cos[\operatorname{sen}(\operatorname{sen} x)]$$

7. $f(x) = \dfrac{\operatorname{sen}^2 x}{\operatorname{sen} x^2}$

$$\Rightarrow f'(x) = \frac{\operatorname{sen} x^2 (2 \operatorname{sen} x)(\cos x) - \operatorname{sen}^2 x \cos x^2 (2x)}{\operatorname{sen}^2 x^2}$$

$$f'(x) = \frac{2 \operatorname{sen} x (\cos x \operatorname{sen} x^2 - x \operatorname{sen} x \cos x^2)}{\operatorname{sen}^2 x^2} \quad //$$

8. $f(x) = \tan \frac{x}{2} - \cot \frac{x}{2}$

$$\Rightarrow f'(x) = \sec^2\left(\frac{x}{2}\right)\left(\frac{1}{2}\right) - \left[-\csc^2\left(\frac{x}{2}\right)\left(\frac{1}{2}\right)\right]$$

$$= \frac{1}{2}\sec^2\left(\frac{x}{2}\right) + \frac{1}{2}\csc^2\left(\frac{x}{2}\right)$$

$$= \frac{1}{2}\left[\sec^2\left(\frac{x}{2}\right) + \csc^2\left(\frac{x}{2}\right)\right]$$

$$= \frac{1}{2}\left[\frac{1}{\cos^2\left(\frac{x}{2}\right)} + \frac{1}{\operatorname{sen}^2\left(\frac{x}{2}\right)}\right] = \frac{1}{2}\left[\frac{\operatorname{sen}^2\left(\frac{x}{2}\right) + \cos^2\left(\frac{x}{2}\right)}{\cos^2\left(\frac{x}{2}\right)\operatorname{sen}^2\left(\frac{x}{2}\right)}\right]$$

$$= \frac{1}{2}\left[\frac{1}{\cos^2\left(\frac{x}{2}\right)\operatorname{sen}^2\left(\frac{x}{2}\right)}\right]$$

$$= \frac{1}{2}\left[\frac{1}{\cos\left(\frac{x}{2}\right)\operatorname{sen}\left(\frac{x}{2}\right)\cos\left(\frac{x}{2}\right)\operatorname{sen}\left(\frac{x}{2}\right)}\right]$$

$$= \frac{1}{\operatorname{sen}\left(2\frac{x}{2}\right)\cos\left(\frac{x}{2}\right)\operatorname{sen}\left(\frac{x}{2}\right)} = \frac{1}{\operatorname{sen} x \cos\left(\frac{x}{2}\right)\operatorname{sen}\left(\frac{x}{2}\right)}$$

$$= \frac{2}{2\cos\left(\frac{x}{2}\right)\operatorname{sen}\left(\frac{x}{2}\right)\operatorname{sen} x} = \frac{2}{\operatorname{sen}\left(2\frac{x}{2}\right)\operatorname{sen} x}$$

$$f'(x) = \frac{2}{\operatorname{sen}^2 x} \quad //$$

$9.-\ f(x) = \sec^2 x + \csc^2 x$

$$f(x) = \frac{1}{\cos^2 x} + \frac{1}{\operatorname{sen}^2 x} = \frac{\operatorname{sen}^2 x + \cos^2 x}{\cos^2 x \operatorname{sen}^2 x} = \frac{1}{\cos^2 x \operatorname{sen}^2 x}$$

$$\Rightarrow f'(x) = \frac{(\cos^2 x \operatorname{sen}^2 x)(0) - [2\cos x(-\operatorname{sen} x)\operatorname{sen}^2 x + \cos^2 x\, 2\operatorname{sen} x \cos x]}{(\cos^2 x \operatorname{sen}^2 x)^2}$$

$$= -\frac{-\operatorname{sen} 2x \operatorname{sen}^2 x + \operatorname{sen} 2x \cos^2 x}{\cos^4 x \operatorname{sen}^4 x}$$

$$= -\frac{\operatorname{sen} 2x \cos^2 x - \operatorname{sen} 2x \operatorname{sen}^2 x}{\cos^4 x \operatorname{sen}^4 x}$$

$$= -\frac{\operatorname{sen} 2x [\cos^2 x - \operatorname{sen}^2 x]}{\cos^4 x \operatorname{sen}^4 x}$$

$$= -\frac{\operatorname{sen} 2x \cos 2x}{\cos^4 x \operatorname{sen}^4 x} = -\frac{2 \operatorname{sen} 2x \cos 2x}{2 \cos x \operatorname{sen} x [\cos^3 x \operatorname{sen}^3 x]}$$

$$= -\frac{2 \operatorname{sen} 2x \cos 2x}{\operatorname{sen} 2x [\cos^3 x \operatorname{sen}^3 x]} = -\frac{2\cos 2x}{\cos^3 x \operatorname{sen}^3 x}$$

$$= -\frac{8(2\cos 2x)}{8[\cos x \operatorname{sen} x \cos x \operatorname{sen} x \cos x \operatorname{sen} x]}$$

$$= -\frac{16 \cos 2x}{\operatorname{sen} 2x \operatorname{sen} 2x \operatorname{sen} 2x}$$

$$f'(x) = -\frac{16 \cos 2x}{\operatorname{sen}^3 2x}$$

10: $f(x) = x\sqrt{1+x^2}$

$$\rightarrow f'(x) = 1\cdot\sqrt{1+x^2} + x\cdot\frac{1}{2}\cdot\frac{2x}{\sqrt{1+x^2}}$$

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

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

$$f'(x) = \frac{1+2x^2}{\sqrt{1+x^2}} \quad //$$

11: $f(x) = \dfrac{x}{\sqrt{4-x^2}}$

$$f'(x) = \frac{\sqrt{4-x^2} - x\,\frac{1}{2}\cdot\frac{-2x}{\sqrt{4-x^2}}}{4-x^2}$$

$$= \frac{\sqrt{4-x^2} + \frac{x^2}{\sqrt{4-x^2}}}{4-x^2}$$

$$= \frac{\frac{4-x^2+x^2}{\sqrt{4-x^2}}}{4-x^2} = \frac{4}{(4-x^2)^{3/2}}$$

$$f'(x) = 4(4-x^2)^{-3/2} \quad //$$