

Computing  $\frac{d}{dx} \left[ \csc(x) * \left[ 3^x + \tan^3 \left( e^{17x^2 + \sqrt{x}} \right) \right]^4 \right]$  :

first, the "shape" of this function is

$$a(x) * b \left( c(x) + d \left( f \left( g \left( k \cdot h(x) + j(x) \right) \right) \right) \right)$$

where

$$a(x) = \boxed{\csc(x)}$$

$$b(x) = \boxed{x^4}$$

$$c(x) = \boxed{3^x}$$

$$d(x) = \boxed{x^3}$$

$$f(x) = \boxed{\tan(x)}$$

$$g(x) = \boxed{e^x}$$

$$k = \boxed{17}$$

$$h(x) = \boxed{x^2}$$

$$j(x) = \boxed{\sqrt{x}}$$

calculate:

$$a'(x) = \boxed{-\csc(x) \cot(x)}$$

$$b'(x) = \boxed{4x^3}$$

$$c'(x) = \boxed{\ln(3) * 3^x}$$

$$d'(x) = \boxed{3x^2}$$

$$f'(x) = \boxed{\sec^2(x)}$$

$$g'(x) = \boxed{e^x}$$

$$h'(x) = \boxed{2x}$$

$$j'(x) = \boxed{\frac{1}{2\sqrt{x}}}$$



Put it all back together:

$$\frac{d}{dx} \csc(x) * \left[ 3^x + \tan^3(e^{17x^2 + \sqrt{x}}) \right]^4$$

$$= -\csc(x) \cot(x) * \left( 3^x + \tan^3(e^{17x^2 + \sqrt{x}}) \right)^4$$

$$+ \csc(x) * 4 \left[ 3^x + \tan^3(e^{17x^2 + \sqrt{x}}) \right]^3$$

$$* \left[ \ln(3) 3^x + 3 \left( \tan(e^{17x^2 + \sqrt{x}}) \right)^2 \right]$$

$$* \sec^2(e^{17x^2 + \sqrt{x}})$$

$$* e^{17x^2 + \sqrt{x}}$$

$$* \left( 17 * 2x + \frac{1}{2\sqrt{x}} \right)$$