Symbolab

Solution

$$\frac{\partial}{\partial x}\left(x^3e^{-y}+y^3\sec\left(\sqrt{x}\right)\right)=3e^{-y}x^2+\frac{y^3\sec\left(\sqrt{x}\right)\tan\left(\sqrt{x}\right)}{2\sqrt{x}}$$

Steps

$$\frac{\partial}{\partial x}\left(x^3e^{-y}+y^3\sec\left(\sqrt{x}\right)\right)$$

Treat y as a constant

Apply the Sum/Difference Rule: $(f\pm g)'=f'\pm g'$

$$=\frac{\partial}{\partial x}\left(x^3e^{-y}\right)+\frac{\partial}{\partial x}\left(y^3\sec\left(\sqrt{x}\right)\right)$$

$$\frac{\partial}{\partial x}\left(x^3e^{-y}\right)=3e^{-y}x^2$$

Hide Steps

$$\frac{\partial}{\partial x}\left(x^3e^{-y}\right)$$

Take the constant out: $(a\cdot f)'=a\cdot f'$

$$=e^{-y}\frac{\partial}{\partial x}\left(x^3\right)$$

Apply the Power Rule: $\frac{d}{dx}\left(x^a\right)=a\cdot x^{a-1}$

$$=e^{-y}\cdot 3x^{3-1}$$

Simplify

$$=3e^{-y}x^2$$

$$\frac{\partial}{\partial x}\left(y^3\sec\left(\sqrt{x}\right)\right)=\frac{y^3\sec\left(\sqrt{x}\right)\tan\left(\sqrt{x}\right)}{2\sqrt{x}}$$

Hide Steps

$$\frac{\partial}{\partial x}\left(y^3\sec\left(\sqrt{x}\right)\right)$$

Take the constant out: $(a \cdot f)' = a \cdot f'$

$= y^3 \frac{\partial}{\partial x}\left(\sec\left(\sqrt{x}\right)\right)$

Apply the chain rule: $\frac{df(u)}{dx} = \frac{df}{du} \cdot \frac{du}{dx}$

$f = \sec(u),\ u = \sqrt{x}$

$= y^3 \frac{\partial}{\partial u}(\sec(u)) \frac{\partial}{\partial x}\left(\sqrt{x}\right)$

$\frac{\partial}{\partial u}(\sec(u)) = \sec(u)\tan(u)$

Hide Steps

$\frac{\partial}{\partial u}(\sec(u))$

Apply the common derivative: $\frac{\partial}{\partial u}(\sec(u)) = \sec(u)\tan(u)$

$= \sec(u)\tan(u)$

$\frac{\partial}{\partial x}\left(\sqrt{x}\right) = \frac{1}{2\sqrt{x}}$

Hide Steps

$\frac{\partial}{\partial x}\left(\sqrt{x}\right)$

Apply radical rule: $\sqrt{a} = a^{\frac{1}{2}}$

$= \frac{\partial}{\partial x}\left(x^{\frac{1}{2}}\right)$

Apply the Power Rule: $\frac{d}{dx}\left(x^a\right) = a \cdot x^{a-1}$

$= \frac{1}{2}x^{\frac{1}{2}-1}$

Simplify $\frac{1}{2}x^{\frac{1}{2}-1}$: $\frac{1}{2\sqrt{x}}$

Hide Steps

$\frac{1}{2}x^{\frac{1}{2}-1}$

$x^{\frac{1}{2}-1} = x^{-\frac{1}{2}}$

Hide Steps

$x^{\frac{1}{2}-1}$

Hide Steps

Join $\frac{1}{2}-1$: $-\frac{1}{2}$

$\frac{1}{2}-1$

Convert element to fraction: $1=\frac{1\cdot 2}{2}$

$=-\frac{1\cdot 2}{2}+\frac{1}{2}$

Since the denominators are equal, combine the fractions: $\frac{a}{c}\pm\frac{b}{c}=\frac{a\pm b}{c}$

$=\frac{-1\cdot 2+1}{2}$

$-1\cdot 2+1=-1$ *Hide Steps*

$-1\cdot 2+1$

Multiply the numbers: $1\cdot 2=2$

$=-2+1$

Add/Subtract the numbers: $-2+1=-1$

$=-1$

$=\frac{-1}{2}$

Apply the fraction rule: $\frac{-a}{b}=-\frac{a}{b}$

$=-\frac{1}{2}$

$=x^{-\frac{1}{2}}$

$=\frac{1}{2}x^{-\frac{1}{2}}$

Apply exponent rule: $a^{-b}=\frac{1}{a^b}$

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

$=\frac{1}{2}\cdot\frac{1}{\sqrt{x}}$

Multiply fractions: $\frac{a}{b}\cdot\frac{c}{d}=\frac{a\cdot c}{b\cdot d}$

$=\frac{1\cdot 1}{2\sqrt{x}}$

Multiply the numbers: $1\cdot 1=1$

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

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

$=y^3\sec(u)\tan(u)\frac{1}{2\sqrt{x}}$

Substitute back $u=\sqrt{x}$

$=y^3\sec(\sqrt{x})\tan(\sqrt{x})\frac{1}{2\sqrt{x}}$

Simplify $y^3\sec(\sqrt{x})\tan(\sqrt{x})\frac{1}{2\sqrt{x}}$: $\frac{y^3\sec(\sqrt{x})\tan(\sqrt{x})}{2\sqrt{x}}$ *Hide Steps*

$y^3\sec(\sqrt{x})\tan(\sqrt{x})\frac{1}{2\sqrt{x}}$

Multiply fractions: $a\cdot\frac{b}{c}=\frac{a\cdot b}{c}$

$=\frac{1\cdot y^3\sec(\sqrt{x})\tan(\sqrt{x})}{2\sqrt{x}}$

Multiply: $1\cdot y^3=y^3$

$=\frac{y^3\sec(\sqrt{x})\tan(\sqrt{x})}{2\sqrt{x}}$

$=\frac{y^3\sec(\sqrt{x})\tan(\sqrt{x})}{2\sqrt{x}}$

$=3e^{-y}x^2+\frac{y^3\sec(\sqrt{x})\tan(\sqrt{x})}{2\sqrt{x}}$