

Differentiation - Chain Rule - Trig functions

Find $f'(x)$.

1. $f(x) = \sin(x^3) \longrightarrow f'(x) = 3x^2 \cos(x^3)$
2. $f(x) = \cos(x^2 + 1) \longrightarrow f'(x) = 2x(-\sin(x^2 + 1)) = -2x \sin(x^2 + 1)$
3. $f(x) = \sec(5x) \longrightarrow f'(x) = 5 \sec(5x) \tan(5x)$
4. $f(x) = \tan(\sqrt{x}) \longrightarrow f'(x) = \left(\frac{1}{2}x^{-1/2}\right) \sec^2(\sqrt{x}) = \frac{\sec^2(\sqrt{x})}{2\sqrt{x}}$
5. $f(x) = \sin(3e^x + 1) \longrightarrow f'(x) = 3e^x \cos(3e^x + 1)$
6. $f(x) = \cos\left(\frac{1}{x}\right) = \cos(x^{-1}) \quad f'(x) = -1x^{-2}(-\sin(x^{-1})) = \frac{1}{x^2} \sin\left(\frac{1}{x}\right)$
7. $f(x) = \sec(x\sqrt{x}) = \sec(x^{3/2})$
 $f'(x) = \frac{3}{2}x^{1/2} \sec(x^{3/2}) \tan(x^{3/2}) = \frac{3}{2}\sqrt{x} \sec(x\sqrt{x}) \tan(x\sqrt{x})$
8. $f(x) = \tan(3x^2) \longrightarrow f'(x) = 6x \sec^2(3x^2)$
9. $f(x) = \csc(x^4) \longrightarrow f'(x) = 4x^3(-\csc(x^4) \cot(x^4)) = -4x^3 \csc(x^4) \cot(x^4)$
10. $f(x) = \cot(2x+3) \longrightarrow f'(x) = -2 \csc^2(2x+3)$