

1. Find the derivative of each of the following functions. Simplify your answers completely.

(a) $f(x) = x^2 + 1$

(f) $f(x) = \tan(x^3)$

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

(g) $f(x) = \tan^3(x)$

(c) $f(x) = \sin\left(\sqrt{x^2 + 1}\right)$

(h) $f(x) = \tan^3(x^3)$

(d) $f(x) = \frac{x^2 + 1}{\sec\left(3x + \frac{\pi}{2}\right)}$

(i) $f(x) = 3 \sec\left(\frac{5x}{3}\right)$

(e) $f(x) = \tan(x)$

(j) $f(x) = \pi^3 \csc(\pi x^2)$

(n) $f(x) = \frac{2x \cos(x^2)}{\sin 3x}$

(k) $f(x) = \left(3x^2 + \frac{3}{x^2}\right) \cos(3x)$

(o) $f(x) = \frac{5x^3 - 6x + 7}{2x^2}$

(l) $f(x) = \frac{\cos 3x}{\cot x}$

(p) $f(x) = \frac{x^2 + 3}{(2x - 1)^3} + \frac{7x - 2}{(2x - 1)^2}$

(m) $f(x) = 3 \cos(\cot x)$

2. Find the following higher order derivatives. Simplify your answers completely.

(a) Find $f''(x)$ if $f(x) = (x^3 - 1)^3$

(d) Find $f'''(x)$ if $f(x) = \frac{4x - 3}{x + 1}$

(b) Find $f''(x)$ if $f(x) = \cos(3x) \cot(x)$

(e) Find $f^{(5)}(x)$ if $f(x) = \sin 2x$

(c) Find $f''(x)$ if $f(x) = \cos^3 2x$