

1. Find the derivative of the following functions.

(a) $f(x) = x^3 + \frac{4}{\sqrt{x}} + 2 \ln x + \pi^2$

(b) $f(x) = \cos(5x) e^{x^2}$

(c) $f(x) = \frac{\sqrt{1-x^2}}{x}$ (Simplify your answer.)

(d) $f(x) = \ln(x + c \sin(4x))$ where c is a constant.

(e) $f(x) = \tan(1 + \cos^2(\ln x))$

2. Evaluate each of the following indefinite integrals and check each of your answers.

(a) $\int (x^4 + \frac{2}{\sqrt{x}} + \frac{1}{4x} + 4) dx$

(b) $\int x^2 \sqrt{1+x^3} dx$

(c) $\int x^2 \sqrt{x} dx$

(d) $\int \frac{4}{1+x^2} dx$

(e) $\int \frac{x}{1+x^2} dx$

(f) $\int \sin t \cos^2 t dt$

(g) $\int \frac{e^t}{4-2e^t} dt$

(h) $\int \frac{1}{x \ln x} dx$

(i) $\int \frac{t}{1+t^4} dt$

(j) $\int \frac{\sin t}{1+\cos^2 t} dt$

(k) $\int \frac{e^x}{\sqrt{1-e^{2x}}} dx$