

The majority of the credit you receive will be based on the completeness and the clarity of your responses. Please use equal signs where appropriate and write solutions with a logical flow. Show your work, and avoid saying things that are untrue, ambiguous, or nonsensical.

1. Find the derivatives of the following functions.

(a) $f(t) = \sqrt{\frac{t}{t^2 + 4}}$

(b) $g(y) = \left(\frac{y^2}{y+1}\right)^5$

(c) $y = \sin(\tan(2x))$

(d) $y = \sec^2(e^t) + \tan^2(e^t)$

(e) $[x + (x + \sin^2 x)^3]^4$

(f) $\sqrt{\sin(e^{x^2} \cos(x))}$

2. Evaluate the following integrals.

(a) $\int \sin(x) \cos(\cos(x)) \, dx$

(b) $\int (x+2)e^{-x^2-4x} \, dx$

(c) $\int \frac{1}{2x^2 + 72} \, dx$

(d) $\int \frac{1}{5x^2 + 20} \, dx$

(e) $\int \frac{1}{1-x^3} \, dx$

(f) $\int \frac{1}{x^3 - 16x} \, dx$

(g) $\int \sin(x)e^x \, dx$

(h) $\int x^2 e^x \, dx$