

1. Let $f(x) = x^5 + 2x^3 + 3x + 1$. Given that f is one-to-one, find $(f^{-1})'(-5)$.

2. If $y = x^{\sqrt{x}}$ find y' .

3. Find the derivative of the following functions. (Do not simplify)

(a) $f(x) = \ln(x^4 \sin^2 3x) + 5^{\tan x}$

(b) $g(x) = \tan^{-1}(2x + 7) + 4e^{3x^2 - 2}$

(c) $h(x) = e^{\sec^{-1} x} + \log_3 2x$

(d) $f(x) = (5x^2 + 3xe^{2x})^6$

(e) $g(x) = \ln \left[(3x + 5)^4 (9x^2 - 2x)^6 \right]$

(f) $h(x) = e^{7x-3} \sin^{-1} 6x$

4. Find $\int_{1/6}^{1/3} \frac{2}{\sqrt{1-9x^2}} dx$.

5. Evaluate the following integrals.

(a) $\int (\cos x) e^{7-\sin x} dx$

(b) $\int \frac{-\sec 4\theta \tan 4\theta}{3 + \sec 4\theta} d\theta$

(c) $\int \frac{1}{x(\ln x)^4} dx$

(d) $\int \frac{e^{\sqrt[3]{x}}}{\sqrt[3]{x^2}} dx$

(e) $\int \frac{x+2}{25x^2+1} dx$

6. Evaluate the following limits.

(a) $\lim_{x \rightarrow 0} \frac{e^{9x} - 1 - 9x}{x^2}$

(b) $\lim_{x \rightarrow 0^+} (\cos x)^{1/x^2}$

(c) $\lim_{x \rightarrow 1} \frac{1-x+\ln x}{1+\cos \pi x}$

(d) $\lim_{x \rightarrow 0} \cot 2x \sin 6x dx$

ANSWERS

1. $\frac{1}{14}$

2. $y' = x^{\sqrt{x}} \left[\frac{\sqrt{x}}{x} + \frac{\ln x}{2\sqrt{x}} \right]$

3. (a) $f'(x) = \frac{4}{x} + \frac{6 \cos 3x}{\sin 3x} + 5^{\tan x} (\sec^2 x) \ln 5$

(b) $g'(x) = \frac{2}{(2x+7)^2+1} + 24xe^{3x^2-2}$

(c) $h'(x) = e^{\sec^{-1} x} \cdot \frac{1}{x\sqrt{x^2-1}} + \frac{2}{2x \ln 3}$

(d) $f'(x) = 6(5x^2 + 3xe^{2x})^5(10x + 6xe^{2x} + 3e^{2x})$

(e) $g'(x) = \frac{12}{3x+5} + \frac{6(18x-2)}{9x^2-2x}$

(f) $h'(x) = e^{7x-3} \cdot \frac{6}{\sqrt{1-36x^2}} + 7e^{7x-3} \sin^{-1} 6x$

4. $\frac{2\pi}{9}$

5. (a) $-e^{7-\sin x} + C$

(b) $-\frac{1}{4} \ln |3 + \sec 4\theta| + C$

(c) $-\frac{1}{3(\ln x)^3} + C$

(d) $3e^{\sqrt[3]{x}} + C$

(e) $\frac{1}{50} \ln |25x^2 + 1| + \frac{2}{5} \tan^{-1}(5x) + C$

6. (a) $\frac{81}{2}$

(b) $e^{-1/2}$

(c) $-\frac{1}{\pi^2}$

(d) 3