

Calculus Assignment # 6

(1) Evaluate each of the following integrals please.

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

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

(c) $\int \frac{dx}{(1 + x^2) \tan^{-1}(x)}$

(d) $\int \frac{dx}{x \ln(x)}$

(e) $\int \left(\frac{x^3 + 2x - 3}{x^2 + 1} \right) dx$

(f) $\int e^{3x} \, dx$

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

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

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

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

(k) $\int \tan(5x) \, dx$

(l) $\int \cot\left(\frac{x}{3}\right) \, dx$

(m) $\int \frac{dx}{e^{5x}}$

(n) $\int \tan^3(2x) \, dx$

(o) $\int \cos(x) e^{\sin(x)} dx$

(p) $\int \left(\frac{x + 2}{x + 1} \right) dx$

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

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

(2) Solve each of the following differential equations. Use the given information to evaluate the constant of integration please.

(a) $\frac{dy}{dx} = \frac{2x e^{x^2 - 1}}{e^y}$, $y = 0$ when $x = 1$.

(b) $\frac{dy}{dx} = \frac{y + 1}{2x}$, $x > 0$, $y > -1$, $y = 1$ when $x = 2$.

(3) Find the absolute maximum and minimum values of $y = e^x - 2x$ if $0 \leq x \leq 1$.

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Answers

(1) (a) $\frac{1}{4} \ln |4x + 1| + C$

(j) $\sec^{-1}(e^x) + C$

(b) $\frac{1}{8} \ln(4x^2 + 1) + C$

(k) $-\frac{1}{5} \ln |\cos(5x)| + C$

(c) $\ln |\tan^{-1}(x)| + C$

(l) $3 \ln \left| \sin\left(\frac{x}{3}\right) \right| + C$

(d) $\ln |\ln(x)| + C$

(m) $-\frac{1}{5} e^{-5x} + C$

(e) $\frac{1}{2} x^2 + \frac{1}{2} \ln(x^2 + 1) - 3 \tan^{-1}(x) + C$

(n) $\frac{1}{4} \tan^2(2x) + \frac{1}{2} \ln |\cos(2x)| + C$

(f) $\frac{1}{3} e^{(3x)} + C$

(o) $e^{\sin(x)} + C$

(g) $\frac{1}{2} \ln(1 + e^{2x}) + C$

(p) $x + \ln |x + 1| + C$

(h) $2 \sqrt{e^x - 1} + C$

(q) $e^{\sin^{-1}(x)} + C$

(i) $\tan^{-1}(e^x) + C$

(r) $\tan^{-1}(\ln(x)) + C$

(2) (a) $y = x^2 - 1$

(b) $y = \sqrt{2x} - 1$

(3) Absolute maximum is 1 , absolute minimum is $2 - 2 \ln(2)$.