Calculus Assignment # 7

(1) Evaluate each of the following integrals please.

(a) $\int 2^{x}\,dx$

(b) $\int 5^{4x}\,dx$

(c) $\int \left(\frac{1}{2}\right)^{x} dx$

(d) $\int x\,2^{-x^{2}} dx$

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

(f) $\int \frac{5^{\tan^{-1}(x)}\,dx}{1+x^{2}}$

(g) $\int \frac{3^{x}\,dx}{1+3^{x}}$

(h) $\int \frac{(1+3^{x})\,dx}{3^{x}}$

(i) $\int \frac{\log_{10}(x)\,dx}{x}$

(j) $\int \frac{dx}{x\log_{2}(x)}$

(k) $\int \frac{\log_{4}\left(x^{2}\right)dx}{x}$

(l) $\int \frac{\log_{2}(3x+1)\,dx}{3x+1}$

(m) $\int \frac{\left(\log_{5}(x)\right)^{2}\,dx}{x}$

(n) $\int \frac{dx}{x\left(\log_{8}(x)\right)^{2}}$

(2) Solve each of the following differential equations please.

(a) $\frac{dy}{dt} = ky$, when $t = 0$, $y = 100$, when $t = 8$, $y = 200$.

(b) $\frac{dy}{dx} = \frac{4^{x}}{e^{y}}$, when $y = \ln(2)$, $x = \log_{4}(\ln(4))$.

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Answers

(1) **(a)** $\frac{2^x}{\ln(2)} + C$

(b) $\frac{5^{4x}}{4\ln(5)} + C$

(c) $\frac{-2^{-x}}{\ln(2)} + C$

(d) $\frac{-2^{-x^2}}{2\ln(2)} + C$

(e) $\frac{-3^{\cos(x)}}{\ln(3)} + C$

(f) $\frac{5^{\tan^{-1}(x)}}{\ln(5)} + C$

(g) $\frac{\ln\left(1+3^x\right)}{\ln(3)} + C$

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

(i) $\frac{\ln^2(x)}{2\ln(10)} + C$

(j) $\ln(2)\ln(\ln(x)) + C$

(k) $\frac{\ln^2(x)}{\ln(4)} + C$

(l) $\frac{\ln^2(3x+1)}{6\ln(2)} + C$

(m) $\frac{\ln^3(x)}{3\ln^2(5)} + C$

(n) $-\frac{\ln^2(8)}{\ln(x)} + C$

(2) **(a)** $y = 100\, e^{\frac{t}{8}\ln(2)}$

(b) $y = \ln\left(\frac{4^x}{\ln(4)} + 1\right)$