Calculus Review Worksheet

(1) Evaluate each of the following integrals please.

(a) $\int \frac{dx}{\sqrt{9 - 4x^2}}$

(b) $\int \frac{x^3\,dx}{25 + x^4}$

(c) $\int \frac{x\,dx}{25 + x^4}$

(d) $\int \frac{dx}{x\sqrt{x^{\frac{2}{3}} - 1}}$

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

(f) $\int \frac{e^{\tan(x)}\,dx}{\cos^2(x)}$

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

(h) $\int \frac{(5x + 3)\,dx}{\sqrt{4 - x^2}}$

(i) $\int \tan(3x)\,dx$

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

(k) $\int \frac{\left(e^{2x} + 2\right)dx}{\sqrt{e^{2x} - 4}}$

(l) $\int \frac{(2x + 5)\,dx}{1 + x}$

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

(n) $\int \left(e^x + 1\right)^2\,dx$

(o) $\int \frac{dx}{x^2 + 6x + 9}$

(p) $\int \frac{dx}{x^2 + 6x + 13}$

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

(r) $\int \frac{\left(2x^3 + 11x + 2\right)dx}{x^2 + 4}$

(s) $\int \tan^3(3x)\,dx$

(t) $\int \sec(2x)\,dx$

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

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

(b) $\frac{dy}{dt} = ky$, when $t = 0$, $y = 100$, when $t = 1$, $y = 25$.

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Answers

(1) **(a)** $\frac{1}{2}\sin^{-1}\left(\frac{2x}{3}\right) + C$

(b) $\frac{1}{4}\ln\left(25 + x^4\right) + C$

(c) $\frac{1}{10}\tan^{-1}\left(\frac{x^2}{5}\right) + C$

(d) $3\sec^{-1}\left|x^{\frac{1}{3}}\right| + C$

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

(f) $e^{\tan(x)} + C$

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

(h) $-5\sqrt{4 - x^2} + 3\sin^{-1}\left(\frac{x}{2}\right) + C$

(i) $-\frac{1}{3}\ln\left|\cos(3x)\right| + C$

(j) $\ln(10)\,\ln\left|\ln(x)\right| + C$

(k) $\sqrt{e^{2x} - 4} + \sec^{-1}\left(\frac{1}{2}e^x\right) + C$

(l) $2x + 3\ln\left|x + 1\right| + C$

(m) $\ln\left(1 + x^2\right) + 5\tan^{-1}(x) + C$

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

(o) $\frac{-1}{x + 3} + C$

(p) $\frac{1}{2}\tan^{-1}\left(\frac{x+3}{2}\right) + C$

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

(r) $x^2 + \frac{3}{2}\ln\left(x^2 + 4\right) + \tan^{-1}\left(\frac{x}{2}\right) + C$

(s) $\frac{1}{6}\tan^2(3x) + \frac{1}{3}\ln\left|\cos(3x)\right| + C$

(t) $\frac{1}{2}\ln\left|\sec(2x) + \tan(2x)\right| + C$

(2) **(a)** $y = e^{2 + \tan^{-1}(x)}$

(b) $y = 100\,e^{(-\ln 4)t}$