Calculus Review Worksheet

(1) Evaluate each of the following integrals please.

(a) $\int \left(x^2 + \sqrt{x} - 1 \right) dx$

(b) $\int (6 - 7x)^3 \, dx$

(c) $\int x^3 \left(5 - x^4 \right)^5 dx$

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

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

(f) $\int \frac{\left(\sqrt{x} + 3\right)^3 dx}{\sqrt{x}}$

(g) $\int \frac{3x \, dx}{\sqrt{2x^2 + 3}}$

(h) $\int \left(\frac{2x + 1}{x - 3} \right)^8 \frac{dx}{(x - 3)^2}$

(i) $\int \left(f(x) \cdot g'(x) + f'(x) \cdot g(x) \right) dx$

(j) $\int \left(x^3 - 2 \right)^2 dx$

(k) $\int 3 \sin(5x) \, dx$

(l) $\int \frac{\cos\left(\sqrt{x - 1}\right)}{\sqrt{x - 1}} dx$

(m) $\int \left(1 - \sin^2\left(\frac{1}{2}x\right)\right) \cos\left(\frac{1}{2}x\right) dx$

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

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

(p) $\int \cot^2(x) \, dx$

(q) $\int \frac{\sec^2(x)\tan(x) \, dx}{\sqrt{3 + \sec^2(x)}}$

(r) $\int \cos^2(\pi x) \, dx$

(s) $\int \frac{1}{x^3} \sin\left(\frac{1}{x^2}\right) \cos\left(\frac{1}{x^2}\right) dx$

(t) $\int (\tan(x) + \sec(x))^2 \, dx$

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

(a) $\frac{d^2y}{dx^2} = \frac{16}{x^3}$, the graph of y passes through (2 , 3) with slope 0.

(b) $\frac{dy}{dx} = \frac{\cos(\pi x)}{\sqrt{y}}$, y passes through (1 , 4).

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Answers

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

(b) $-\frac{1}{28}(6 - 7x)^4 + C$

(c) $-\frac{1}{24}\left(5 - x^4\right)^6 + C$

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

(e) $6\sqrt{\sqrt[3]{x} + 3} + C$

(f) $\frac{1}{2}\left(\sqrt{x} + 3\right)^4 + C$

(g) $\frac{3}{2}\sqrt{2x^2 + 3} + C$

(h) $-\frac{1}{63}\left(\frac{2x + 1}{x - 3}\right)^9 + C$

(i) $f(x) \cdot g(x) + C$

(j) $\frac{1}{7}x^7 - x^4 + 4x + C$

(k) $-\frac{3}{5}\cos(5x) + C$

(l) $2\sin\left(\sqrt{x - 1}\right) + C$

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

(n) $\frac{1}{12}\tan^4(3x) + C$

(o) $\frac{1}{6}\sec^3(2x) + C$

(p) $-\cot(x) - x + C$

(q) $\sqrt{3 + \sec^2(x)} + C$

(r) $\frac{1}{2}x + \frac{1}{4\pi}\sin(2\pi x) + C$

(s) $-\frac{1}{4}\sin^2\left(\frac{1}{x^2}\right) + C$ or $\frac{1}{4}\cos^2\left(\frac{1}{x^2}\right) + C$

(t) $2\tan(x) + 2\sec(x) - x + C$

(2) **(a)** $y = \frac{8}{x} + 2x - 5$

(b) $\frac{2}{3}y^{\frac{3}{2}} = \frac{1}{\pi}\sin(\pi x) + \frac{16}{3}$