

Evaluate: (give exact answers)

$$(a) \int x \tan^2 x \, dx \quad ; (b) \int_{\frac{\pi^2}{16}}^{\frac{\pi^2}{9}} \frac{\csc \sqrt{x} \cot \sqrt{x}}{\sqrt{x}} \, dx \quad ; (c) \int_0^{\frac{\pi}{2}} e^{2x} \cos 3x \, dx$$

$$(d) \int \cot^3 x \csc^5 x \, dx \quad ; (e) \int \frac{\cos(\arctan t)}{t^2+1} \, dt \quad ; (f) \int x^3 \cos 3x \, dx$$

$$(g) \int \frac{2x-1}{x^2(3x-1)} \, dx \quad ; (h) \int \frac{3x^3-5x^2-11x+9}{x^2-2x-3} \, dx \quad ; (i) \int \frac{3x^2+4}{x^2-4} \, dx$$

$$(j) \int x \arccos x \, dx \quad ; (k) \int (\arcsin x)^2 \, dx \quad ; (l) \int \frac{\sqrt{4x^2-25}}{x} \, dx$$

$$(m) \int \frac{dx}{x\sqrt{x^4-25}} \, dx \quad ; (n) \int_1^{\sqrt{3}} \frac{\sqrt{x^2+1}}{x^4} \, dx \quad ; (o) \int \frac{dx}{x^2\sqrt{9-x^2}}$$

$$(p) \int x^5 e^{-x^2} \, dx \quad ; (q) \int x \arctan x \, dx \quad ; (r) \int \frac{6x^2-16x+3}{(x-2)^2(2x+1)} \, dx$$

$$(s) \int \sqrt{1-4x^2} \, dx \quad ; (t) \int \frac{3x-2}{(x+1)^2(x-1)} \, dx$$

Answers:

$$(a) x \tan x - \frac{1}{2}x^2 - \ln|\sec x| + C \quad ; (b) -\frac{4}{\sqrt{3}} + 2\sqrt{2} \quad ; (c) -\frac{3}{13}e^{\pi} - \frac{2}{13}$$

$$(d) -\frac{1}{7}(\csc x)^7 + \frac{1}{5}(\csc x)^5 + C \quad ; (e) \sin(\arctan t) + C$$

$$(f) \frac{1}{3}x^3 \sin 3x + \frac{1}{3}x^2 \cos 3x - \frac{2}{9}x \sin 3x - \frac{2}{27} \cos 3x + C$$

$$(g) \ln|x| - \frac{1}{x} - \ln|3x-1| + C \quad ; (h) \frac{3}{2}x^2 + x + 3 \ln|x-3| - 3 \ln|x+1| + C$$

$$(i) 3x + 4 \ln|x-2| - 4 \ln|x+2| + C$$

$$(j) \frac{x^2}{2} \arccos x + \frac{1}{4} \arcsin x - \frac{x \sqrt{1-x^2}}{4} + C$$

$$(k) x (\arcsin x)^2 + 2 \sqrt{1-x^2} \arcsin x - 2x + C$$

$$(l) \sqrt{4x^2-25} - 5 \operatorname{arcsec} \left(\frac{x}{5} \right) + C ; (m) \frac{1}{10} \operatorname{arcsec} \left(\frac{x^2}{5} \right) + C$$

$$(n) \frac{-8}{9\sqrt{3}} + \frac{2\sqrt{2}}{3} ; (o) -\frac{\sqrt{9-x^2}}{9x} + C$$

$$(p) -\frac{1}{2}x^4 e^{-x^2} - x^2 e^{-x^2} - e^{-x^2} + C$$

$$(q) \frac{x^2}{2} \arctan x - \frac{1}{2}x + \frac{1}{2} \arctan x + C$$

$$(r) 2 \ln|x-2| + \frac{1}{x-2} + \ln|2x+1| + C$$

$$(s) \frac{1}{4} \arcsin 2x + \frac{1}{2} \left(x \sqrt{1-4x^2} \right) + C$$

$$(t) -\frac{1}{4} \ln|x+1| - \frac{5}{2(x+1)} + \frac{1}{4} \ln|x-1| + C$$

REMEMBER : $\sin 2\theta = 2 \sin \theta \cos \theta$