

Al-Mustaqbal University / College of Engineering & Technology

Department Of Communication Engineering Class (1st)

Subject (calculus 1) / Code (TE-UOMUS-094241217-574)

Lecturer (M.Sc. Fatimatulzahraa Adnan)

2nd term – Lecture No.2 & Lecture Name (integration of trigonometric function)

5-2- <u>Integrals of trigonometric functions</u> : The integration formulas for the trigonometric functions are:

6) $\int \sin u \cdot du = -\cos u + c$ 8) $\int \tan u \cdot du = -\ln|\cos u| + c$ 10) $\int \sec u \cdot du = \ln|\sec u + \tan u| + c$ 12) $\int \sec^2 u \cdot du = \tan u + c$ 14) $\int \sec u \cdot \tan u \cdot du = \sec u + c$

7)
$$\int \cos u \cdot du = \sin u + c$$

9)
$$\int \cot u \cdot du = \ln |\sin u| + c$$

11)
$$\int \csc u \cdot du = -\ln |\csc u + \cot u| + c$$

13)
$$\int \csc^2 u \cdot du = -\cot u + c$$

15)
$$\int \csc u \cdot \cot u \cdot du = -\csc u + c$$

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EX-2- Evaluate the following integrals:

 $1) \int \cos(3\theta - 1)d\theta \qquad 6) \int \frac{d\theta}{\cos^2 \theta}$ $2) \int x \cdot \sin(2x^2) dx \qquad 7) \int (1 - \sin^2 3t) \cdot \cos 3t \, dt$ $3) \int \cos^2(2y) \cdot \sin(2y) dy \qquad 8) \int \tan^3(5x) \cdot \sec^2(5x) \, dx$ $4) \int \sec^3 x \cdot \tan x \, dx \qquad 9) \int \sin^4 x \cdot \cos^3 x \, dx$ $5) \int \sqrt{2 + \sin 3t} \cdot \cos 3t \, dt \qquad 10) \int \frac{\cot^2 \sqrt{x}}{\sqrt{x}} dx$



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Sol.-1) $\frac{1}{2}\int 3\cos(3\theta-1)d\theta = \frac{1}{2}\sin(3\theta-1)+c$ 2) $\frac{1}{4}\int 4x \cdot \sin(2x^2) dx = -\frac{1}{4}\cos(2x^2) + c$ $3) - \frac{1}{2} \int (\cos 2y)^2 \cdot (-2\sin 2y \, dy) = -\frac{1}{2} \cdot \frac{(\cos 2y)^3}{3} + c = -\frac{1}{6} (\cos 2y)^3 + c$ 4) $\int \sec^2 x \cdot (\sec x \cdot \tan x \cdot dx) = \frac{\sec^3 x}{2} + c$ 5) $\frac{1}{3}\int (2+\sin 3t)^{\frac{1}{2}} (3\cos 3t \ dt) = \frac{1}{3} \cdot \frac{(2+\sin 3t)^{\frac{3}{2}}}{\frac{3}{2}} + c = \frac{2}{9}\sqrt{(2+\sin 3t)^3} + c$ 6) $\int \frac{d\theta}{\cos^2 \theta} = \int \sec^2 \theta \cdot d\theta = \tan \theta + c$ 7) $\int (1 - \sin^2 3t) \cdot \cos 3t \, dt = \frac{1}{3} \int 3\cos 3t \, dt - \frac{1}{3} \int (\sin 3t)^2 \cdot 3\cos 3t \, dt$ $=\frac{1}{2}\sin 3t - \frac{1}{2}\cdot \frac{\sin^3 3t}{2} + c = \frac{1}{2}\cdot \sin 3t - \frac{1}{6}\sin^3 3t + c$ 8) $\frac{1}{5}\int \tan^3 5x \cdot (5 \sec^2 5x \, dx) = \frac{1}{5} \cdot \frac{\tan^4 5x}{4} + c = \frac{1}{20}\tan^4 5x + c$ 9) $\int \sin^4 x \cdot \cos^3 x \, dx = \int \sin^4 x \cdot (1 - \sin^2 x) \cdot \cos x \, dx$ $= \int \sin^4 x \cdot \cos x \, dx - \int \sin^6 x \cdot \cos x \, dx = \frac{\sin^5 x}{5} - \frac{\sin^7 x}{7} + c$

$$10) \int \frac{\cot^2 \sqrt{x}}{\sqrt{x}} dx = \int \frac{\csc^2 \sqrt{x} - 1}{\sqrt{x}} dx = 2 \int \frac{\csc^2 \sqrt{x}}{2\sqrt{x}} - \int x^{-\frac{1}{2}} dx$$
$$= 2 \left(-\cot \sqrt{x} \right) - \frac{x^{\frac{1}{2}}}{\frac{1}{2}} + c = -2 \cot \sqrt{x} - 2\sqrt{x} + c$$