

Post Assn. 4

Wed
9/13

I. Sum and difference formulas, with applications

$$A. \sin(x+y) = \sin x \cos y + \cos x \sin y$$

$$\Rightarrow \sin(x-y) = \sin x \cos y - \cos x \sin y$$

$$[\pm \Rightarrow] \sin x \cos y = \frac{1}{2} [\sin(x+y) + \sin(x-y)]$$

$$\cos x \sin y = \frac{1}{2} [\sin(x+y) - \sin(x-y)]$$

(Can also be obtained by switching x and y , if same.)

Ex. $\int_0^{\pi} \sin 2x \cos 3x dx = (\text{For slow!})$

$$= \frac{1}{2} \left[\int_0^{\pi} \sin 5x dx + \int_0^{\pi} \sin(-x) dx \right] = \left. \begin{array}{l} u = 5x \Rightarrow du = 5 dx \end{array} \right\}$$

$$\frac{1}{2} \left[\frac{1}{5} \int_0^{5\pi} \sin u du + \cos x \Big|_0^{\pi} \right] = \dots$$

$$B. \cos(x+y) = \cos x \cos y - \sin x \sin y$$

$$\Rightarrow \cos(x-y) = \cos x \cos y + \sin x \sin y$$

$$[\pm \Rightarrow] \cos x \cos y = \frac{1}{2} [\cos(x+y) + \cos(x-y)]$$

$$\sin x \sin y = \frac{1}{2} [\cos(x-y) - \cos(x+y)]$$

$$\text{Ex. } \int \sin 2x \cos x \, dx \quad (\text{Finish at home})$$

More importantly for our purposes:

$$\cos 2x = \cos^2 x - \sin^2 x = 1 - 2\sin^2 x = 2\cos^2 x - 1$$

Memorize!

$$\sin^2 x = \frac{1}{2}(1 - \cos 2x) \quad \cos^2 x = \frac{1}{2}(1 + \cos 2x)$$

$$\text{Ex. } \int \cos^2 x \, dx = (\text{Fun them now!})$$

$$\text{Ex. } \int \cos^4 x \, dx = \int (\cos^2 x)^2 \, dx = \dots$$

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$$\text{Ex. } \int \cos^3 x \, dx = \int (1 - \sin^2 x) \cos x \, dx = \dots$$

$$\text{Ex. } \text{See if you can figure out } \int \sin^5 x \cos^3 x \, dx$$

II. More trigonometric integrals

$$\text{A. } \int_0^{\pi/2} \cos^2 x \sin^2 x \, dx$$

$$\text{B. } \int_0^{\pi/4} \tan^3 x \sec^3 x \, dx = \int_0^{\pi/4} \sec^5 x \tan x \, dx = \int_0^{\pi/4} \sec^3 x \tan^2 x \, dx = \dots$$

$$C. \int_0^{\pi/4} \tan^2 x \sec^4 x dx = \dots$$

$$D. \int_0^{\pi/4} \tan^2 x \sec^3 x dx = \int_0^{\pi/4} \sec^5 x dx - \int_0^{\pi/4} \sec^3 x dx$$

See 7.1 #54, but
try it from scratch!

E. $\int \sec^4 x dx =$ *For them, finish at home if necessary.*

Th. 9/14
I. Catch up; questions
II. Review of volume:

A. Review essential ideas of area

B. Work w/ general illustration to derive
the differential

C. Do problem 2 on Assn. #3.

Fri. 9/15
I. Catch up; questions
II. Quiz!