(9/30/08)

Math 10B. Lecture Examples.

Section 7.3. Tables of integrals[†]

Example 1 **Find the area of the region between $y = \dfrac{1}{x(3x+6)}$ and the x-axis for $1 \le x \le 3$. Use the following formula from a table of integrals:**

$$\int \frac{1}{(ax+b)(cx+d)}\,dx = \frac{1}{ad-bc}\ln\left|\frac{ax+b}{cx+d}\right| + C \quad \text{for } a \neq 0, c \neq 0, ad-bc \neq 0.$$

Answer: [Area] $= \frac{1}{6}\ln(\frac{9}{5})$

Example 2 **Find a formula for the function $y = F(x)$ such that $F'(x) = x^2e^x$ for all x and $F(0) = 3$. Use the following formula from a table of integrals:**

$$\int x^2e^{ax}\,dx = \left(\frac{1}{a}x^2 - \frac{2}{a^2}x + \frac{2}{a^3}\right)e^{ax} + C$$

Answer: $F(x) = (x^2 - 2x + 2)e^x + 1$

Example 3 **Find the area of the region between the x-axis and $y = \sin x \cos x$ for $0 \le x \le \frac{1}{2}\pi$.Use the following formula from a table of integrals:**

$$\int \sin(ax)\cos(ax)\,dx = \frac{1}{2a}\sin^2(ax) + C$$

Answer: [Area] $= \frac{1}{2}$

Example 4 **Find the antiderivative $\displaystyle\int \frac{e^x}{4-(e^x)^2}\,dx$. Use the following formula from a table of integrals:**

$$\int \frac{1}{a^2-u^2}\,du = \frac{1}{2a}\ln\left|\frac{u+a}{u-a}\right| + C$$

Answer: $\displaystyle\int \frac{e^x}{4-(e^x)^2}\,dx = \frac{1}{4}\ln\left|\frac{e^x+2}{e^x-2}\right| + C$

Interactive Examples

Work the following Interactive Examples on Shenk's web page, http//www.math.ucsd.edu/~ashenk/:[‡]

Section 8.5: Examples 1 through 3

[†]Lecture notes to accompany Section 7.3 of *Calculus* by Hughes-Hallett et al.

[‡]The chapter and section numbers on Shenk's web site refer to his calculus manuscript and not to the chapters and sections of the textbook for the course.