Math 243

Exam 1 → take home on Monday, due Wed.

12.1 – 12.4
6.5 – 6.8
] 2 probs / section

Webassign: I'll start this weekend on getting this up to date.

Ch 7 More Integration..

$$\int f(x)\,dx = F(x) + C$$

F is an antiderivative of f

$$D_x[f \cdot g] = f' \cdot g + f \cdot g'$$

$$A_x[f' \cdot g + f \cdot g'] = f \cdot g + C$$

$$\int (f' \cdot g + f \cdot g')\,dx = f g + C$$

$$\int f' g\,dx + \int f g'\,dx = f g + C$$

Integration by Parts

$$\int f \cdot g'\,dx = f \cdot g - \int f' g\,dx$$

f, f' ← D_x ; g, g' ← A_x

$$\int x \cdot \cos x\,dx = x \sin x - \int \sin x\,dx$$

$f = x \quad f' = 1$

$g' = \cos x \quad g = \sin x$

Notation:

$$\int f g' \, dx = fg - \int f' g \, dx \qquad f \xrightarrow{D_x} f' \qquad g' \xrightarrow{A_x} g$$

$$\int u \, dv = uv - \int v \, du$$

let $u = f \xrightarrow{D_x} du = f' \, dx$

$dv = g' \, dx \xrightarrow{A_x} v = g$

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ex

$$\int \cos(\ln x) \, dx = \int \cos(u) \, x \, du \qquad (x = e^u)$$

let $u = \ln x \leftrightarrow e^u = x$

$du = \frac{1}{x} dx \rightarrow dx = x \, du$

$u = \ln x$

$e^u = x$

$$\int e^u \cos(u) \, du = e^u \sin(u) - \int e^u \sin(u) \, du \quad (\star)$$

$f = e^u \xrightarrow{D_x} f' = e^u \, du$

$g' = \cos(u) \xrightarrow{A_x} g = \sin(u)$

$(\star)$ $\int e^u \sin u \, du = \left[-e^u \cos u + \int e^u \cos(u) \, du \right]$ $(\star)$

$f = e^u \longrightarrow f' = e^u$

$g' = \sin u \longrightarrow g = -\cos u$

So $\int e^u \cos u \, du = e^u \sin u - \left[-e^u \cos u + \int e^u \cos(u) \, du \right]$

5.3 $\int e^u \cos u\,du = e^u \sin u + e^u \cos u - \int e^u \cos(u)\,du$

$2\int e^u \cos u\,du = e^u \sin u + e^u \cos u + C$

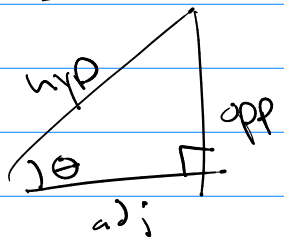
$\int e^u \cos u\,du = \frac{1}{2}e^u \sin u + \frac{1}{2}e^u \cos u + C$

at start: (x^5) $\quad u = \ln x$ Let sub

$\int \cos(\ln x)\,dx = \frac{1}{2}x \sin(\ln x) + \frac{1}{2}x \cos(\ln x) + C$

7.2 Trig. Integrals

Pythag. Identities



$opp^2 + adj^2 = hyp^2$

$\sin^2\theta + \cos^2\theta = 1$

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

$\sin(a+b) = \sin a \cos b + \cos a \sin b$

$\int \sin^m x\,dx$

$\int \sqrt{a^2 - x^2}$

let $u = \cos^?$ $\quad du = \sin x\,dx$