Math 131 Homework: Day 9

See me if you need help: M & W 3:00–4:30, Tu 1:30–3:00, & F 1:30–2:30 or by appointment. **Math Intern** Sunday: 12–6pm, M & Tu: 3–10pm, W & Th: 5–10pm in Lansing 310. Course website: `http://math.hws.edu/~mitchell/Math131S12/index.html`

Practice and Reading

1. a) Reread and review Section 5.4 on substitution, which we will finish next class.
   b) ✍ Practice substitution while things are still relatively simple! Page 363ff #9–23 odd, 27.

Hand In and Due Wednesday:

Do WeBWorK set Day09.
Be very neat so that I can grade them quickly and get them back to you in Lab. Put a box around your answers so I can find them. Clearly note any substitution.

1. Determine $\int 3x^2(x^3+9)^{-5}\,dx.$ $= \int u^{-5}\,du = -\frac{1}{4}u^{-4}+C = -\frac{1}{4}(x^3+9)^{-4}$

$u = x^3$

$du = 3x^2\,dx$

2. Determine $\int \cos x\sqrt{4+2\sin x}\,dx.$ $= \int \sqrt{u}\cdot\frac{1}{2}\,du = \frac{1}{2}\int u^{1/2}\,du$

$u = 4+2\sin x$ $= \frac{2}{3}\cdot\frac{1}{2}\cdot u^{3/2}+C$

$du = 2\cos x\,dx$ $= \frac{1}{3}(4+2\sin x)^{3/2}+C$

$\frac{1}{2}du = \cos x\,dx$

3. Determine $\int \frac{(\ln t)^3}{t}\,dt.$ $= \int u^3\,du = \frac{u^4}{4}+C = \frac{1}{4}(\ln t)^4+C$

$u = \ln t$

$du = \frac{1}{t}\,dt$

4. Determine $\int (x+2)\sin(x^2+4x)\,dx.$ $= \int \sin(u)\,\frac{1}{2}\,du$

$u = (x^2+4x)$ $= -\frac{1}{2}\cos u + C$

$du = (2x+4)\,dx$ $= -1/2\cos(x^2+4x)+C$

$\frac{1}{2}du = (x+2)\,dx$

5. Determine $\int \frac{x^5}{1+4x^6}\,dx$. $= \int \frac{1}{24} \cdot \frac{1}{u} \cdot du = \frac{1}{24} \ln|u| + C$

$u = 1 + 4x^6$

$du = 24x^5\,dx$

$\frac{1}{24}\,du = x^5\,dx$

$= \frac{1}{24} \ln|1+4x^6| + C$

6. Fill in the blank with a function that makes this an easy problem to do and then solve it. $\int e^{x+\tan x}(\underline{1+\sec^2 x})\,dx$. (u ↙, du ↙)

$= \int e^u\,du = e^u + C = e^{x+\tan x} + C$

7. **Practice: Starting Integration Problems.** Sometimes starting a problem is the hardest thing. Decide which method is appropriate for each: basic rules, algebraic simplification, "mental adjustment,' still others require u-substitution. Complete the table. **You do not actually have to do the antidifferentiation.**

Integral	**Method**	**If u-sub, then u =? and du =?**
$\int (3x+2)(6x^2+8x)^5\,dx$	u-sub	$u = 6x^2+8x$, $du = (12x+8)$
$\int (3x+2)(6x+8)\,dx$	Multiply out	
$\int \frac{1}{5\sqrt[4]{x^3}}\,dx$	Simplify →	$\frac{1}{5}\int x^{-3/4}\,dx$
$\int \sec^2(3x)\,dx$	Mental Adjust	$= \frac{1}{3}\tan(3x)$
$\int \sin(\cos x)\sin x\,dx$	u-sub	$u = \cos x$, $du = -\sin x\,dx$
$\int \frac{4}{1+x^2}\,dx$	Arctan	
$\int \frac{4x}{1+x^2}\,dx$	u-sub	$u = 1+x^2$ $du = 2x\,dx$
$\int \frac{1+x^2}{x}\,dx$	Divide	
$\int \frac{t}{\sqrt{1-t^2}}\,dt$	u-sub	$u = 1-t^2$, $du = -2t\,dt$
$\int \frac{1}{\sqrt{1-t^2}}\,dt$	Arcsine	