Due date: ____________ **Name:** ______________________________

1. Evaluate the following integrals.

   a) $\int \cos x \sqrt{1+\sin x}\, dx$

   $u = 1 + \sin x$

   $du = \cos x\, dx$

   $= \int \sqrt{u} \cdot du$

   $= \int u^{1/2}\, du$

   $\frac{u^{3/2}}{(3/2)} = \frac{2}{3} u^{3/2}$

   $= \frac{2}{3} u^{3/2} + C$

   $= \boxed{\frac{2}{3}(1+\sin x)^{3/2} + C}$

   b) $\int e^{2\cos x} \cdot \sin x\, dx$

   c) $\int 3x e^{x^2+2}\, dx$

   $u = x^2 + 2$

   $du = 2x\, dx$

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

   $\frac{3}{2} du = 3x\, dx$

   $= \int e^u \cdot \frac{3}{2} du$

   $= \frac{3}{2} \int e^u\, du$

   $= \frac{3}{2} e^u + C$

   $= \boxed{\frac{3}{2} e^{x^2+2} + C}$

d) $\int \frac{\sec x \tan x}{1+\sec^2 x} dx$

e) $\int \sqrt{-2x+3}\, dx$

$u = -2x + 3$

$du = -2dx$

$-\frac{1}{2} du = dx$

$= \int \sqrt{u} \cdot \left(-\frac{1}{2} du\right)$

$= -\frac{1}{2} \int u^{1/2} du$

$= -\frac{1}{2}\left(\frac{2}{3} u^{3/2}\right) + C$

$= \boxed{-\frac{1}{3}(-2x+3)^{3/2} + C}$

f) $\int \frac{2}{3-5x} dx$

g) $\int \frac{2}{x(\ln x)^3}\,dx$

h) $\int \frac{\log_2 x}{x}\,dx$

$= \int \log_2 x \cdot \frac{1}{x}\,dx$

$u = \log_2 x$

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

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

$= \int u \cdot (\ln 2)\,du$

$= \ln 2 \int u\,du$

$= (\ln 2) \cdot \frac{u^2}{2} + C = \boxed{(\ln 2)\frac{(\log_2 x)^2}{2} + C}$ (or $\frac{(\log_2 x)^2 \ln 2}{2} + C$)

i) $\int \frac{2 \sin x \cos x}{1+\cos^2 x}\,dx$

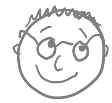
j) $\int \frac{dx}{(\tan^{-1} x)^2(1+x^2)}$

$$= \int \frac{1}{(\tan^{-1}x)^2} \cdot \frac{1}{1+x^2}\,dx$$

$u = \tan^{-1}x$

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

Note: $\tan^{-1}x \neq \frac{1}{\tan x}$!



$$= \int \frac{1}{u^2} \cdot du$$

$$= \int u^{-2}\,du$$

$$= \frac{u^{-1}}{-1} + C = -\frac{1}{u} + C = \boxed{-\frac{1}{\tan^{-1}x} + C}$$

k) $\int \tan x \, dx$

l) $\int \cot x \, dx$

$$= \int \frac{\cos x}{\sin x}\,dx$$

$u = \sin x$

$du = \cos x\,dx$

$$= \int \frac{1}{u} \cdot du$$

$$= \ln|u| + C$$

$$= \boxed{\ln|\sin x| + C}$$

m) $\int (2x^2+1)(2x^3+3x+3)^5\,dx$

n) $\int \frac{3x^3+6}{(x^4+8x)^5}\,dx$

$u = x^4 + 8x$

$du = (4x^3+8)\,dx$

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

$\frac{3}{4}du = (3x^3+6)\,dx$

$= \int \frac{1}{u^5}\cdot\frac{3}{4}\,du$

$= \frac{3}{4}\int u^{-5}\,du$

$= \frac{3}{4}\left(\frac{u^{-4}}{-4}\right) + C$

$= \frac{-3}{16}\cdot\frac{1}{u^4} + C = \boxed{\frac{-3}{16(x^4+8x)^4} + C}$

o) $\int x\sqrt{1-x^2}\,dx$

p) $\int x\sqrt{1-x}\,dx$

$u = 1-x \to x = 1-u$

$du = -dx$

$-du = dx$

$$= \int \underbrace{(1-u)\sqrt{u}}_{\substack{(1-u)u^{1/2} \\ u^{1/2}-u^{3/2}}} \cdot (-du)$$

$$= -\int \left(u^{1/2} - u^{3/2}\right) du$$

$$= -\left(\frac{2}{3}u^{3/2} - \frac{2}{5}u^{5/2}\right) + C$$

$$= \boxed{\frac{2}{5}(1-x)^{5/2} - \frac{2}{3}(1-x)^{3/2} + C}$$

q) $\int \frac{x+1}{x^2+1}\,dx$

$$= \int \left(\frac{x}{x^2+1} + \frac{1}{x^2+1} \right) dx$$

$$= \int \frac{x}{x^2+1}\,dx + \int \frac{1}{x^2+1}\,dx$$

$u = x^2+1$

$du = 2x\,dx$

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

$$= \int \frac{1}{u} \cdot \frac{1}{2}\,du + \tan^{-1}x + C$$

$$= \frac{1}{2}\ln|u| + \tan^{-1}x + C$$

$$= \boxed{\frac{1}{2}\ln|x^2+1| + \tan^{-1}x + C}$$

Q: Which eight-letter word still remains a word after removing each letter from it?

STARTING
STARING
STRING
STING
SING
SIN
IN
I

Optional exercises from the Stewart textbook if you'd like more practice:
5.5 (p.418) #1-47 odd