MAT 126 Fall 2020, Quiz 8

Name	ID	Section

THIS QUIZ IS WORTH 10 POINTS.
NO BOOKS OR CALCULATORS ARE ALLOWED.
• ONE PAGE OF NOTES ON INTEGRATION FORMULAS ARE ALLOWED.

Write the correct answer in the box.

(1) ☐ Integrate by parts: $\int xe^x dx$.

(a) $x^2e^x + C$
(b) $xe^x + C$
(c) $xe^x + x + C$
(d) $xe^x - x + C$
(e) $xe^x - e^x + C$
(f) none of the above

(2) ☐ Integrate by parts: $\int x \ln x dx$.

(a) $\frac{1}{2}x^2 \ln x + \frac{1}{4}x^2 + C$
(b) $\frac{1}{2}x^2 \ln x - \frac{1}{4}x^2 + C$
(c) $x^2 \ln x - \frac{1}{2}x^2 + C$
(d) $\frac{1}{2}x \ln x - \frac{1}{2}x + C$
(e) $x \ln x - \frac{1}{2}x + C$
(f) none of the above

(3) ☐ If we apply integration by parts once to $\int \sin \ln x dx$ using $dv = 1$, get:

(a) $x \cos \ln x - \int \sin \ln x dx + C$
(b) $x \sin \ln x - \int \cos \ln x dx + C$
(c) $\sin \ln x - \int \cos \ln x dx + C$
(d) $x \sin \ln x + x \int \cos \ln x dx + C$
(e) $\sin \ln x + \int \cos \ln x dx + C$
(f) none of the above

(4) ☐ Apply integration by parts to the answer of the previous problem, again with $dv = 1$. Use the result to solve for $\int \sin \ln x dx$.

(a) $\frac{1}{2} \sin \ln x - \frac{1}{2} \cos \ln x + C$
(b) $\frac{1}{2}x \cos \ln x - x\frac{1}{2} \sin \ln x + C$
(c) $\frac{1}{2} \sin \ln x + \frac{1}{2} \cos \ln x + C$
(d) $\frac{1}{2}x \sin \ln x + \frac{1}{2}x \cos \ln x + C$
(e) $\frac{1}{2}x \sin \ln x - \frac{1}{2}x \cos \ln x + C$
(f) none of the above

(5) ☐ Evaluate $\int_1^e \ln(x^3) dx$.

(a) 1
(b) 1/2
(c) 2
(d) 3/2
(e) 3
(f) 4
(g) e
(h) $2e$
(i) e^2
(j) $3e$
(k) $4e$
(m) none of the above

For each of the following integrals select the appropriate strategy from the list below.

(6) ☐ $\int \cos^8 x \sin^5 x dx$

(7) ☐ $\int \tan^5 x dx$

(8) ☐ $\int \cos(10x)\cos(15x)dx$

Trigonometric integration strategies:
(a) Replace $\sin^2 x$ by $1-\cos^2 x$ and the use substitution $u = \cos x$.
(b) Replace $\cos^2 x$ by $1-\sin^2 x$ and the use substitution $u = \sin x$.
(c) Use $\sin^2 x = \frac{1}{2}(1-\cos 2x)$ or $\cos^2 x = \frac{1}{2}(1+\cos 2x)$, then (a) or (b).
(d) Use $\sin(ax)\sin(bx) = \frac{1}{2}\cos((a-b)x) - \frac{1}{2}\cos((a+b)x)$.
(e) Use $\sin(ax)\cos(bx) = \frac{1}{2}\sin((a-b)x) + \frac{1}{2}\sin((a+b)x)$.
(f) Use $\cos(ax)\cos(bx) = \frac{1}{2}\cos((a-b)x) + \frac{1}{2}\cos((a+b)x)$.
(g) Rewrite $\sec^j x = \sec^{j-2} x \sec^2 x$ and use $\sec^2 x = \tan^2 x + 1$. Then let $u = \tan x$.
(h) Rewrite $\tan^k x \sec^j x = \tan^{k-1} \sec^{j-1} x \tan x \sec x$ and use $\tan^2 = \sec^2 - 1$.
Then use $u = \sec x$
(i) Use $\tan^k x = \tan^{k-2} x \tan^2 x = \tan^{k-2} x(\sec^2 x - 1) = \tan^{k-2} x \sec^2 x - \tan^{k-2} x$.
Repeat if necessary.
(j) Use $\tan^2 x = \sec^2 x - 1$. Then integrate by parts the powers of $\sec x$.

(9) ☐ Find $\int \sin^3 x \cos^3 x dx$.

(a) $\frac{1}{4}\sin^4 x + \frac{1}{5}\sin^5 x + C$
(b) $\frac{1}{4}\sin^4 x + \frac{1}{4}\cos^4 x + C$
(c) $\frac{1}{4}\sin^4 x - \frac{1}{6}\sin^6 x + C$
(d) $\frac{1}{5}\sin^5 x - \frac{1}{5}\cos^5 x + C$
(e) $\frac{1}{3}\sin^3 x - \frac{1}{4}\sin^4 x + C$
(f) none of the above

(10) ☐ Find $\int \tan^4 x \sec^4 x dx$.

(a) $\frac{1}{7}\tan^7 x - \frac{1}{5}\tan^5 x + C$
(b) $\frac{1}{7}\tan^7 x + \frac{1}{5}\tan^5 x + C$
(c) $\frac{1}{7}\tan^7 x - \frac{1}{6}\tan^6 x + C$
(d) $\frac{1}{6}\tan^6 x + \frac{1}{5}\sec^5 x + C$
(e) $\frac{1}{7}\sec^7 x + \frac{1}{6}\sec^6 x + C$
(f) none of the above

Answers: 1D, 2E, 3G, 4C, 5G, 6F, 7I, 8B, 9E, 10I