Total Points = 35 https://tinyurl.com/mr2nejjc

Patterns in Integrals

Academic Honesty Statement:

I understand that I may discuss this lab with others if I give them credit in this statement. I also understand that I am required to write my report--that to copy all or part of someone else's report or to allow someone else to copy all or part of my report constitutes plagiarism, which is a serious violation of academic honesty.
I discussed this lab with

I wrote my own report. I did not copy any of this report from anyone else and I did not allow anyone else to copy any of this report.
Signed:

Purpose: In this lab, Maple Learn will be used to investigate indefinite integrals of families of functions. By observing the patterns that occur in the integrals of several members of the family, you will first guess and then in some cases prove, a general formula for the integral of any member of the family.

To find the indefinite integral in Maple Learn, use the link provided. Click on Evaluate Integral of the initial function for each part. Type over the function to get the results of each integral.

Take a screenshot of your work from Maple and paste into the document, handwrite using tablet or copy and paste hand written work from notebook. All work must be shown on KAMI.

1. **a. Use Maple to evaluate the following integrals. (2 points)**

(i) $\int \frac{1}{(x+2)\cdot(x+3)}\,dx$

(ii) $\int \frac{1}{(x+1)\cdot(x+5)}\,dx$

(iii) $\int \frac{1}{(x+2)\cdot(x-5)}\,dx$

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

b. Based on the patterns of your responses in part (a), guess the value of the integral $\int \frac{1}{(x+a)\cdot(x+b)}dx$ if $a \neq b$. DO NOT USE MAPLE (2 points)

c. What if a = b, like in part (iv)? DO NOT USE MAPLE(2 points)

d. Prove your answer to #1 part b using partial fractions. (3 points)

e. Prove your answer to #1 part c using u substitution. (3 points)

2. **a. Use Maple to evaluate the following integrals. Type sin(x) or cos(x) in Maple. (2 points)**

(i) $\int sin(x)\, cos(2x) dx$

(ii) $\int \sin(3x) \cos(7x)\, dx$

(iii) $\int \sin(8x) \cos(3x)\, dx$

(iv) $\int sin(5x) \cos(3x)\, dx$

b. Based on the pattern of your responses in part (a), guess the value of the integral $\int \sin(ax) \cos(bx)\, dx$**. DO NOT USE MAPLE** (2 points)

c. Use the identity $\sin x \cos y = \frac{1}{2}[\sin(x+y) + \sin(x-y)]$ **to prove your conjecture from part (b)** (3 points)

3. **a. Use Maple to evaluate the following integrals. Type ln(x) in Maple. (2 points)**

(i) $\int ln(x)\, dx$

(ii) $\int x\, ln(x)\, dx$

(iii) $\int x^2\, ln(x) dx$

(iv) $\int x^3\, ln(x) dx$

(v) $\int x^7\, ln(x)\, dx$

b. Based on the pattern of your responses in part (a), guess the value of

$\int \boldsymbol{x^n\, ln(x)\, dx}$**. DO NOT USE MAPLE** (2 points)

c. Use Integration by Parts to prove the conjecture that you made in part (b). (3 points)

d. For what values of n is it valid? (2 points)

4. a. Use Maple to evaluate the following integrals. Type exp(x) in Maple (2 points)

(i) $\int xe^x\,dx$

(ii) $\int x^2\,e^x dx$

(iii) $\int x^3\,e^x dx$

(iv) $\int x^4\,e^x d$

b. Based on the pattern of your responses in part (a), guess the value of

$\int x^{10}\, e^{x} dx$**. DO NOT USE MAPLE** (2 points)

c. Based on the patterns in parts (a) and (b), make a conjecture as to the value of the integral $\int x^{n}\, e^{x} dx$ **when n is a positive integer.** (3 points)

List out the first few terms then . . . and the last few terms