Integration by Parts

SUGGESTED REFERENCE MATERIAL:

As you work through the problems listed below, you should reference Chapter 7.2 of the recommended textbook (or the equivalent chapter in your alternative textbook/online resource) and your lecture notes.

EXPECTED SKILLS:

- Be able to use integration by parts to evaluate various integrals, including integrands involving products of functions, isolated logarithmic functions, or isolated inverse trigonometric functions.

PRACTICE PROBLEMS:

For problems 1-12, evaluate the given integral.

1. $\int xe^{4x}\,dx$
2. $\int x^2\cos(x)\,dx$
3. $\int x^2\ln(x)\,dx$
4. $\int \frac{\ln x}{x^4}\,dx$
5. $\int \arcsin(x)\,dx$
6. $\int x\sec^2(x)\,dx$
7. $\int \ln(x^2+10)\,dx$
8. $\int e^{2x}\cos(3x)\,dx$
9. $\int x\arctan(x)\,dx$
10. $\int x^3\cos(x^2)\,dx$

11. $\displaystyle\int_0^{\pi} 3x \sin(x)\, dx$

12. $\displaystyle\int_0^{1} x^2 e^x\, dx$

13. Suppose that u and v are differentiable functions of x with $\displaystyle\int_{x=0}^{x=1} v\, du = 3$ and the following functional values.

x	$u(x)$	$v(x)$
0	5	2
1	7	-4

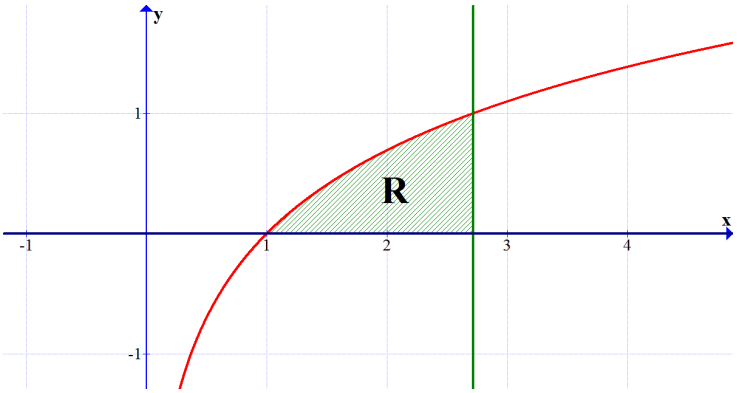
Use this information to compute $\displaystyle\int_{x=0}^{x=1} u\, dv$.

14. Evaluate $\displaystyle\int \sin\sqrt{x}\, dx$ by first making an appropriate substitution and then applying integration by parts.

15. Evaluate $\displaystyle\int \left(\sin^{-1} x\right)^2\, dx$

16. Find the area of the region which is enclosed by $y = \ln x$, $y = 1$, and $x = e^2$.

17. Let R be the region enclosed by the graphs of $y = \ln x$, $x = e$, and the x-axis (as shown below).



Find the volume of the solid that results from revolving R around the line $y = -1$.

18. Let f be a differentiable function. Use integration by parts to show:

$$\int f(x)\, dx = xf(x) - \int xf'(x)\, dx$$