

Substitute u name in parts: key

AP Calculus BC: 10.4 Integration by Parts

LIARTE

Find the integral of the following functions. I have placed one regular u-sub problem in the mix of the integration by parts. GOOD LUCK!

1. $\int 4x \sin(x) dx$

$u = 4x$ $v = -\cos(x)$
 $du = 4dx$ $dv = \sin(x) dx$

$-4x \cos(x) + \int +4 \cos(x) dx$
 $-4x \cos(x) + 4 \sin(x) + C$

2. $\int x e^x dx$

$u = x$ $v = e^x$
 $du = dx$ $dv = e^x dx$

$x e^x - \int e^x dx$

$x e^x - e^x + C$

3. $\int x^3 \ln(4x) dx$

$u = \ln(4x)$ $v = \frac{x^4}{4}$
 $du = \frac{1}{x} dx$ $dv = x^3 dx$

$\frac{\ln(4x)x^4}{4} - \int \frac{x^3}{4} dx$

$\frac{\ln(4x)x^4}{4} - \frac{x^4}{16} + C$

5. $\int 4x e^{x^2} dx$

$\int \frac{4x e^u}{2x} du$ $u = x^2$
 $\int 2e^u du$ $du = 2x dx$
 $dx = \frac{du}{2x}$

$2e^u + C = 2e^{x^2} + C$

4. $\int \ln(x) \sqrt[3]{x^2} dx$

$u = \ln(x)$ $v = \frac{3x^{5/3}}{5}$
 $du = \frac{1}{x} dx$ $dv = x^{2/3} dx$

$\frac{3x^{5/3} \ln(x)}{5} - \int \frac{3x^{2/3}}{5} dx$

$\frac{3x^{5/3} \ln(x)}{5} - \frac{3x^{5/3}}{5(5/3)} = \frac{3x^{5/3} \ln(x)}{5} - \frac{9x^{5/3}}{25} + C$

6. $\int -8x \cos(x) dx$

$u = -8x$ $v = \sin(x)$
 $du = -8 dx$ $dv = \cos(x) dx$

$-8x \sin(x) + \int 8 \sin(x) dx$

$-8x \sin(x) - 8 \cos(x) + C$

7. Find the area under the curve of the function $f(x) = \ln(x)$ for the interval $[1,3]$.

$u = \ln(x)$ $v = \frac{x^2}{2}$
 $du = \frac{1}{x} dx$ $dv = x dx$

$\ln(x) - \int \frac{x}{2} dx$
 $\left[\frac{x^2 \ln(x)}{2} - \frac{x^2}{4} \right]_1^3$

$\left(\frac{\ln(3)}{2} - \frac{3^2}{4} \right) - \left(\frac{\ln(1)}{2} - \frac{1^2}{4} \right)$

$\frac{9 \ln(3)}{2} - \frac{9}{4} + \frac{1}{4}$

$\frac{9 \ln(3)}{2} - \frac{8}{4} = \frac{9 \ln(3)}{2} - 2$