Integration by Parts

Evaluate each indefinite integral using integration by parts. *u* and *dv* are provided.

1) $\int xe^x \, dx; \quad u = x, \quad dv = e^x \, dx$

2) $\int x\cos x \, dx; \quad u = x, \quad dv = \cos x \, dx$

3) $\int x \cdot 2^x \, dx; \quad u = x, \quad dv = 2^x \, dx$

4) $\int \sqrt{x} \ln x \, dx; \quad u = \ln x, \quad dv = \sqrt{x} \, dx$

Evaluate each indefinite integral.

5) $\int xe^{-x} \, dx$

6) $\int x^2 \cos 3x \, dx$

7) $\int \frac{x^2}{e^{2x}} \, dx$

8) $\int x^2 e^{5x} \, dx$

9) $\int \ln (x + 3) \, dx$

10) $\int \cos 2x \cdot e^{-x} \, dx$

Integration by Parts

Evaluate each indefinite integral using integration by parts. *u* and *dv* are provided.

1) $\int x e^x \, dx$; $u = x, \; dv = e^x \, dx$

     $xe^x - e^x + C$

2) $\int x \cos x \, dx$; $u = x, \; dv = \cos x \, dx$

     $x \sin x + \cos x + C$

3) $\int x \cdot 2^x \, dx$; $u = x, \; dv = 2^x \, dx$

     $\dfrac{x \cdot 2^x}{\ln 2} - \dfrac{2^x}{(\ln 2)^2} + C$

4) $\int \sqrt{x} \ln x \, dx$; $u = \ln x, \; dv = \sqrt{x} \, dx$

     $\dfrac{2x^{\frac{3}{2}} \ln x}{3} - \dfrac{4x^{\frac{3}{2}}}{9} + C$

Evaluate each indefinite integral.

5) $\int x e^{-x} \, dx$

     Use: $u = x, \; dv = e^{-x} \, dx$

     $\int x e^{-x} \, dx = \dfrac{-x - 1}{e^x} + C$

6) $\int x^2 \cos 3x \, dx$

     Use: $u = x^2, \; dv = \cos 3x \, dx$

     $\int x^2 \cos 3x \, dx = \dfrac{x^2 \sin 3x}{3} + \dfrac{2x \cos 3x}{9} - \dfrac{2 \sin 3x}{27} + C$

7) $\int \dfrac{x^2}{e^{2x}} \, dx$

     Use: $u = x^2, \; dv = \dfrac{1}{e^{2x}} \, dx$

     $\int \dfrac{x^2}{e^{2x}} \, dx = \dfrac{-2x^2 - 2x - 1}{4e^{2x}} + C$

8) $\int x^2 e^{5x} \, dx$

     Use: $u = x^2, \; dv = e^{5x} \, dx$

     $\int x^2 e^{5x} \, dx = \dfrac{x^2 e^{5x}}{5} - \dfrac{2x e^{5x}}{25} + \dfrac{2 e^{5x}}{125} + C$

9) $\int \ln (x + 3) \, dx$

     Use: $u = \ln (x + 3), \; dv = dx$ *or use u-subs first

     $\int \ln (x + 3) \, dx = x \ln (x + 3) - x + 3 \ln (x + 3) + C$

10) $\int \cos 2x \cdot e^{-x} \, dx$

     Use: $u = e^{-x}, \; dv = \cos 2x \, dx$

     $\int \cos 2x \cdot e^{-x} \, dx = \dfrac{2 \sin 2x - \cos 2x}{5 e^x} + C$