If we substitute in $\int 5x \ln(x)\, dx$ with $u = 5x$ and $dv = \ln(x)\, dx$ then

(a) $du = \frac{5x^2}{2}$ and $v = \frac{1}{x}$

(b) $du = \frac{5x^2}{2}\, dx$ and $v = \frac{1}{x}$

(c) $du = 5\, dx$ and $v = \frac{1}{x}\, dx$

(d) $du = 5x^2\, dx$ and $v = \frac{1}{x}$

(e) None of the above

If we substitute in $\int 5x \ln(x)\, dx$ with $u = \ln(x)$ and $dv = 5x\, dx$ then

(a) $du = \frac{1}{x}$ and $v = 5$

(b) $du = \frac{1}{x}\, dx$ and $v = 5dx$

(c) $du = \frac{1}{x}\, dx$ and $v = \frac{5x^2}{2}$

(d) $du = \ln(x)\, dx$ and $v = \frac{5x^2}{2}$

(e) None of the above

Evaluate the following using integration by parts

1. $\int xe^{3x}\,dx$

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

3. $\int x^2e^x\,dx$

4. $\int x^3e^{x^2}\,dx$

   Hint: $u = x^2$ and $dv = xe^{x^2}dx$

5. $\int \ln(x)\,dx$

6. $\int \ln(x)^2\,dx$

7. $\int e^{\sqrt{x}}\,dx$

   Hint: $u = \sqrt{x}$

8. $\int \arctan(x)\,dx$