## Integration by Parts (Exam Problems with Solutions):

1. **Question:** Evaluate  $\int xe^{x} dx$ .

**Solution:** Let u = x and  $dv = e^x dx$ . Then, du = dx and  $v = e^x$ .

Applying integration by parts:  $\int xe^{x} dx = xe^{x} - \int e^{x} dx = xe^{x} - e^{x} + C.$ 

2. **Question:** Find  $\int x \sin(x) dx$ .

Solution: Let u = x and dv = sin(x) dx. Then, du = dx and v = -cos(x). Applying integration by parts:  $\int x sin(x) dx = -x cos(x) + \int cos(x) dx = 1 + Cos(x) + sin(x) + C$ . 3. Question: Calculate  $\int h(x) dx$ .

Applying integration by parts:  $\int \ln(x) \, dx = x \ln(x) - \int (1/x) * x \, dx = x \ln(x) - x + C.$ 

4. **Question:** Evaluate  $\int x^2 \cos(x) dx$ .

**Solution:** Let  $u = x^2$  and dv = cos(x) dx. Then, du = 2x dx and v = sin(x).

Applying integration by parts:  $\int x^2 \cos(x) dx = x^2 \sin(x) - \int 2x \sin(x) dx.$ 

5. **Question:** Find  $\int e^x \sin(x) dx$ .

**Solution:** Let  $u = e^x$  and dv = sin(x) dx. Then,  $du = e^x dx$  and v = -cos(x).