MATH 206
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QUIZ 4
ANSWER KEY

Summer 2001

1. $I = \int xe^{-x}dx$
Integration by parts: $u = x,\ du = dx;\ dv = e^{-x}dx,\ v = -e^{-x}$.
$I = -xe^{-x} + \int e^{-x}dx = -xe^{-x} - e^{-x} + C$

2. $I = \int e^x \cos(2x)\,dx$
Integration by parts: $u = \cos(2x),\ du = -2\sin(2x)\,dx;\ dv = e^x dx,\ v = e^x$
$I = e^x\cos(2x) + 2\int e^x \sin(2x)dx$
Integration by parts: $u_1 = \sin(2x),\ du_1 = 2\cos(2x)\,dx;\ dv_1 = e^x dx,\ v_1 = e^x$
$I = e^x\cos(2x) + 2(e^x\sin(2x) - 2\int e^x\cos(2x)dx) = e^x\cos(2x) + 2e^x\sin(2x) - 4I$
Solve for I:
$5I = e^x\cos(2x) + 2e^x\sin(2x)$
Answer: $I = \frac{1}{5}e^x\cos(2x) + \frac{2}{5}e^x\sin(2x) + C$

3. $I = \int x^5 \ln x\,dx$
Integration by parts: $u = \ln x,\ du = \frac{1}{x}dx;\ dv = x^5 dx,\ v = \frac{x^6}{6}$
$I = \frac{x^6}{6}\ln x - \int \frac{x^6}{6}\left(\frac{1}{x}\right)dx = \frac{x^6}{6}\ln x - \frac{1}{6}\int x^5 dx = \frac{x^6}{6}\ln x - \frac{x^6}{36} + C$

4. $I = \int x^2 \sin x\,dx$
Integration by parts: $u = x^2,\ du = 2x\,dx;\ dv = \sin x\,dx,\ v = -\cos x$
$I = -x^2\cos x + 2\int x\cos x\,dx$
Integration by parts: $u_1 = x,\ du_1 = dx;\ dv_1 = \cos x\,dx,\ v_1 = \sin x$
$I = -x^2\cos x + 2(x\sin x - \int \sin x\,dx) = -x^2\cos x + 2x\sin x + 2\cos x + C$

5. $I = \int \ln(2x)\,dx$
Integration by parts: $u = \ln(2x),\ du = \frac{1}{2x}(2)dx = \frac{1}{x}dx;\ dv = dx,\ v = x$
$I = x\ln(2x) - \int x\left(\frac{1}{x}\right)dx = x\ln(2x) - \int dx = x\ln(2x) - x + C$