Math 128, Spring 2008
Quiz 4, Section A

Name: _____

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible. Please write down all relevant mathematics. You have 20 minutes.

1. Evaluate the integral

$$\int_1^{\sqrt{e}} x \ln(x^2)\,dx$$

$y = x^2$, $dy = 2x\,dx$

$$= \frac{1}{2}\int_1^{e} \ln(y)\,dy$$

$u = \ln(y)$, $dv = dy$

$du = \frac{1}{y}dy$, $v = y$

$$= \frac{1}{2}\left[y\ln(y) - y\right]_1^e$$

$$= \frac{1}{2}\left[e - e - (-1)\right] = \frac{1}{2}$$

2. Evaluate:

$$\int_1^{e} x^2 \ln(x^2)\,dx$$

$u = \ln(x^2)$, $dv = x^2$

$du = \frac{2}{x}dx$, $v = \frac{x^3}{3}$

$$\int x^2\ln(x^2)\,dx = \frac{x^3}{3}\ln(x^2) - \frac{2}{3}\int x^2\,dx = \frac{x^3}{3}\ln(x^2) - \frac{2}{3}\cdot\frac{x^3}{3} + C$$

$$= \frac{x^3}{3}\left[\ln(x^2) - \frac{2}{3}\right] + C.$$

Evaluating gives:

$$\frac{e^3}{3}\left[2 - \frac{2}{3}\right] - \frac{1}{3}\left[0 - \frac{2}{3}\right]$$

$$= \frac{4}{9}e^3 + \frac{2}{9}.$$

Math 128, Spring 2008
Quiz 4, Section B

Name: _____

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible. Please write down all relevant mathematics. You have 20 minutes.

1. Evaluate the integral

$$\int_1^{\sqrt{e}} \frac{\ln(x^2)}{x}\,dx$$

$$= 2\int_1^{\sqrt{e}} \frac{\ln(x)}{x}\,dx$$

$u = \ln(x)$ $\quad du = \frac{1}{x}dx$

$$= 2\int_0^{\frac{1}{2}} u\,du$$

$$= 2\,\frac{u^2}{2}\Big|_0^{\frac{1}{2}} = u^2\Big|_0^{\frac{1}{2}} = \frac{1}{4}$$

2. Evaluate:

$$\int_1^{\sqrt{e}} \frac{\ln(x^2)}{x^2}\,dx$$

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

$du = \frac{2}{x}dx$ $\quad v = -\frac{1}{x}$

$$\int \frac{\ln(x^2)}{x^2}\,dx = -\frac{1}{x}\ln(x^2) + 2\int \frac{1}{x^2}dx = -\frac{1}{x}\ln(x^2) - \frac{2}{x} + C$$

$$= -\frac{1}{x}\left[\ln(x^2) + 2\right] + C$$

Evaluating $= -\frac{1}{\sqrt{e}}\left[1+2\right] + 1\left[0+2\right]$

$$= 2 - \frac{3}{\sqrt{e}}.$$

Math 128, Spring 2008
Quiz 4, Section D

Name: _____

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible. Please write down all relevant mathematics. You have 20 minutes.

1. Evaluate the integral

$$\int_0^1 xe^{x^2}\,dx$$

$u = x^2$
$du = 2x\,dx$

$$= \frac{1}{2}\int_{u=0}^{u=1} e^u\,du = \frac{1}{2}\,e^u\Big|_0^1 = \frac{1}{2}(e-1)$$

2. Evaluate:

$$\int_0^1 x^3e^{x^2}\,dx$$

$y = x^2$
$dy = 2x\,dx$.

$$\int x^3e^{x^2}\,dx = \frac{1}{2}\int ye^y\,dy = \frac{1}{2}\left(ye^y - e^y\right) + C.$$

$u = y \quad dv = e^y\,dy$
$du = dy \quad v = e^y$

Evaluating, we get: $\frac{1}{2}\left[e - e - (0-1)\right] = \frac{1}{2}$.