MAC 2312 (Calculus II) — Answers
QUIZ 4, Friday September 16, 2016

Name: **PID:**

Remember to show all your work; you won't get any credits if you do not show the steps to your answers.

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1. [3] Use integration by parts to evaluate the integral:

$$\int_1^2 \sqrt{x}\ln x\,dx = \frac{2}{3}x^{3/2}\ln x\Big]_1^2 - \int \frac{2}{3}x^{3/2}\cdot\frac{1}{x}dx = \frac{2}{3}(2\sqrt{2}\ln 2 - \ln 1) - \frac{2}{3}\int_1^2 x^{1/2}dx$$

$$= \frac{4}{3}\sqrt{2}\ln 2 - \frac{4}{9}x^{3/2}\Big]_1^2, \text{ as } \ln 1 = 0$$

$$= \frac{4}{3}\sqrt{2}\ln 2 - \frac{4}{9}(2\sqrt{2}-1)$$

$u = \ln x$

$du = \frac{dx}{x}$

$dv = \sqrt{x}dx = x^{1/2}dx$

$v = \frac{2}{3}x^{3/2}$

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2. [3] Evaluate the integral

$$\int \cos^3 x\,dx = \int \cos^2 x\cdot\cos x\,dx = \int (1-u^2)du = u - \frac{u^3}{3} + C$$

$$= \sin x - \frac{\sin^3 x}{3} + C$$

Set $u = \sin x$

$du = \cos x\,dx$

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3. [2] Evaluate the integral:

$$\int \sec^2(\tan x)\sec^2(x)\,dx = \int \sec^2(u)du = \tan(u) + C = \tan(\tan x) + C$$

$u = \tan x$

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

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4 [2] Given that $\ln a = -2$ and $\ln c = 5$, evaluate the integral by using the definition of the natural logarithmic function:

$$\int_a^{\frac{c}{a^3}} \frac{1}{t}dt = \int_a^1 \frac{1}{t}dt + \int_1^{\frac{c}{a^3}} \frac{1}{t}dt,$$

$$= -\ln a + \ln\frac{c}{a^3}, \text{ by definition of } \ln$$

$$= -\ln a + \ln c - \ln(a^3), \text{ by quotient property of } \ln$$

$$= -\ln a + \ln c - 3\ln a$$

$$= -4\ln a + \ln c = -4(-2) + 5 = 13$$