Name: _____

Make-Up Exam # 1 – Math 2312H – Spring 2013

You may use your (approved) graphing calculator. On the free-response parts be sure to show work, explain how you got an answer, or receive no credit.

1. The indefinite integral $\int x \ln x dx$ is:

   (a) $\frac{x^2 \ln x}{2} + \frac{x^2}{4} + C$ (b) $\frac{x^2}{4}(2\ln x - 1) + C$ (c) $\frac{x}{2}(x \ln x - 2) + C$

   (d) $x \ln x - \frac{x^2}{4} + C$ (e) $\frac{(\ln x)}{x} - \frac{x^2}{4} + C.$

2. The definite integral $\int_0^1 x^2 e^x dx$ equals:

   (a) $\frac{e}{3}$ (b) $\frac{e}{2} - \frac{2}{e^2}$ (c) $e - 2$ (d) $\frac{e^2}{2} - \frac{2}{e^3}$ (e) e

3. Find the following limit

$$\lim_{t \to 0} \frac{1}{t} \ln\left(\frac{2+t}{2}\right)$$

   (a) e^2 (b) 1 (c) $\frac{1}{2}$ (d) 0 (e) Does not exist

4. $\int \sin^2 x \cos x dx =$

   (a) $\cos^3 x + C$ (b) $\frac{1}{3}\sin^3 x + C$ (c) $\frac{1-\cos(2x)}{2} + C$ (d) $\cos x - \cos^3 x + C$ (e) $-\frac{1}{6}\cos^3 x \sin^2 x + C$

5. $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \frac{\cos x}{\sin x} dx =$

   (a) $\ln \sqrt{2}$ (b) $\ln \frac{\pi}{4}$ (c) $\ln \sqrt{3}$ (d) $\ln \frac{\sqrt{3}}{2}$ (e) 0

6. $\int x\sqrt{x-2} dx$

   (a) $\frac{2}{3}x^2(x-2)^{3/2} + C$

   (b) $\frac{1}{2}\arctan(x^2 - 2) + C$

   (c) $\frac{2}{3}x(x-2)^{3/2} + \frac{4}{15}(x-2)^{5/2} + C$

   (d) $\frac{2}{5}(x-2)^{5/2} + \frac{4}{3}(x-2)^{3/2} + C$

   (e) $-\arcsin(2-x) + C$

7. Find

$$\lim_{x\to 0} \frac{1-\cos^2(2x)}{x^2}$$

(a) -2 (b) 1 (c) 0 (d) 2 (e) 4

8. $\int x\sec^2 x dx$

(a) $x\tan x + C$ (b) $\frac{x^2}{2}\tan x + C$ (c) $\sec^2 x + 2\sec^2 x\tan x + C$

(d) $x\tan x - \ln|\cos x| + C$ (e) $x\tan x + \ln|\cos x| + C$

9. Which of the following are true statements.

I. $f(x) = e^x$ grows at a faster rate than $g(x) = x^e$.

II. $f(x) = \ln x^2$ grows at a slower rate than $g(x) = (\ln x)^2$.

III. $\lim_{x\to\infty} x\cos x = 0$.

(a) I only (b) I and II only (c) II only (d) I and III only (e) I, II, and III

10. $\int \frac{dx}{(x-1)(x+3)} =$

(a) $\frac{1}{4}\ln|\frac{x-1}{x+3}| + C$

(b) $\frac{1}{4}\ln|\frac{x+3}{x-1}| + C$

(c) $\frac{1}{2}\ln|(x+3)(x-1)| + C$

(d) $\frac{1}{2}\ln|\frac{2x+2}{(x-1)(x+3)}| + C$

(e) $\ln|(x-1)(x+3)| + C$

11. Which of the following is equal to $\int \frac{2x^3-6x^2-15x+5}{x^2-2x-8}dx =$

(a) $\int (2x+2)dx$

(b) $\int \frac{2x-2}{x^2-2x-8}dx$

(c) $\int (2x-2+\frac{5x-7}{x^2-2x-8})dx$

(d) $\int (2x-2-\frac{3x+11}{x^2-2x-8})dx$

(e) $\int \frac{3x-11}{x^2-2x-8}dx$

Free Response – Remember to show work!

12. Prove using Integration By Parts that

$$\int e^x \sin x dx = \frac{1}{2} (\sin x - \cos x) e^x$$

13. Compute

$$\lim_{x \to \infty} (1 + \frac{1}{x})^{2x}$$