MATH 22 PRACTICE EXAM ON BASIC INTEGRATION

Name:

Section:

Instructions:

(1) Books, notes, and calculators are not permitted.
(2) Simplify as instructed.
(3) Show your work as instructed. On some problems, correct answers without justification will not receive full credit.

(1)

(2)

(3)

(4)

(5)

Total

Problem 1. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Which of the following indefinite integrals evaluates to

$$\frac{\sin^4(5x)}{4} + C?$$

A. $\int \sin^3(5x)\,dx$.

B. $\int 5\sin^3(5x)\,dx$.

C. $\int \sin^3(5x)\cos(5x)\,dx$.

D. $\int 5\sin^3(5x)\cos(5x)\,dx$.

E. None of these.

Problem 2. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Which of the following indefinite integrals evaluates to

$$\ln|\ln(x)| + C?$$

A. $\int \frac{dx}{x\ln(x)}$.

B. $\int \frac{dx}{1/x}$.

C. $\int \frac{dx}{\ln(x)}$.

D. $\int x\ln(x)\,dx$.

E. None of these.

Problem 3. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Which of the following is a correct evaluation of

$$\int e^{x^2} 3x \, dx?$$

A. It is $3 \cdot \frac{1}{2} \int e^{x^2} 2x \, dx = \frac{3}{2} e^{x^2} + C$.

B. It is $3 \int e^{x^2} x \, dx = 3e^{x^2} + C$.

C. It is $3 \int e^{x^2} 2x \, dx = \frac{3}{2} e^{x^2} + C$.

D. It is $3 \cdot \frac{1}{2} \int e^{x^2} x \, dx = 3e^{x^2} + C$.

E. None of these.

Problem 4. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Which of the following is a correct evaluation of

$$\int e^{x^2} \, dx?$$

A. It is $\frac{1}{2x} \int e^{x^2} 2x \, dx = \frac{1}{2x} e^{x^2} + C$.

B. It is $\int e^{x^2} \, dx = e^{x^2} + C$.

C. It is $\frac{1}{2} \int e^{x^2} \, dx = \frac{1}{2} e^{x^2} + C$.

D. It has no formula in terms of elementary functions.

E. None of these.

Problem 5. (15 pts.) Consider the indefinite integral

$$\int \cos^4(3x^2)\sin(3x^2)x\,dx.$$

For what constants a, b do we have

$$\begin{aligned}\int \cos^4(3x^2)\sin(3x^2)x\,dx &= a\int [\cos(3x^2)]^4 b\sin(3x^2)x\,dx \\ &= \frac{a\cos^5(3x^2)}{5} + C?\end{aligned}$$

Do as little work as possible.

Problem 6. (15 pts.) Consider the indefinite integral

$$\int (5x^4 + 4x)^{12}(10x^3 + 2)\,dx.$$

For what constants a, b do we have

$$\begin{aligned}\int (5x^4 + 4x)^{12}(10x^3 + 2)\,dx &= a\int (5x^4 + 4x)^{12} b(10x^3 + 2)\,dx \\ &= \frac{a(5x^4 + 4x)^{13}}{13} + C?\end{aligned}$$

Do as little work as possible.

Problem 7. (15 pts.) Evaluate the definite integral

$$\int_5^{10} x\sqrt{x-1}\,dx.$$

Show your work and express your answer as a sum of four reduced fractions and/or integers. You do not need to combine the four numbers into one fraction.

Problem 8. (15 pts.) Evaluate the indefinite integral

$$\int (x^3 + 3x)(x^2 + 1)\, dx.$$

Show your work and simplify your answer. You may factor any polynomials in your answer as much or as little as you like.

Problem 9. (15 pts.) Evaluate the indefinite integral

$$\int \sin\left(\frac{2\pi x}{a} + b\right)\, dx.$$

Show your work and express your evalutation in terms of functions of the forms $\sin(f(x) + g(x))$, $\cos(f(x) + g(x))$, etc.