Calculus 2 — Exam 3
MAT 308, Fall 2011 — D. Ivanšić

Name: _____

Show all your work!

Find the following integrals:

1. (10pts) $\int x^5 \ln x \, dx =$

2. (15pts) $\int \sin^5 x \cos^4 x \, dx =$

3. (15pts) $\int e^{3x} \cos(5x) \, dx =$

Use trigonometric substitution to evaluate the following integrals. Don't forget to return to the original variable where appropriate.

4. (15pts) $\int x^3\sqrt{x^2-1} =$

5. (15pts) $\int_0^{\sqrt{3}} \frac{x^2}{\sqrt{4-x^2}}\,dx =$

Use the method of partial fractions to find the following integrals.

6. (12pts) $\displaystyle\int \frac{3x+18}{(x-1)(x+2)}\,dx =$

7. (18pts) $\displaystyle\int \frac{x^2-13x+6}{(x-5)(x^2+9)}\,dx =$

Bonus (10pts) How do those reduction formulas come about? For example, consider the one that reduces $\int \sin^n x\,dx$ to $\int \sin^{n-2} x\,dx$. Start as follows:

$$\int \sin^n x\,dx = \int \sin^{n-2} x \sin^2 x\,dx = \int \sin^{n-2} x(1-\cos^2 x)\,dx = \ldots$$

Continue by splitting the last integral and applying a clever integration by parts on $\int \sin^{n-2} x \cos^2 x\,dx$. Soon you will arrive at the reduction formula for $\int \sin^n x\,dx$.