1. (20) Evaluate the following trigonometric integrals:

(i) $\int \sin^2 x \, \mathrm{d}x,$

(ii) $\int \tan^3 x \sec^3 x \, \mathrm{d}x.$

2. (25) Evaluate the following definite or indefinite integrals:

(i) $\int x^3(x+4)^{1/2}\,\mathrm{d}x,$

(ii) $\int_{-1}^{1} \ln(1+x^2)\,\mathrm{d}x,$

(iii) $\int e^{-5x} \sin x \, \mathrm{d}x.$

3. (15) Find $\int \sinh^5 x \cosh^3 x \, \mathrm{d}x$.

4. (20) Let $f(x) = \displaystyle\int_{\pi/4}^{x} \sqrt{\tan^2 t - 1}\, \mathrm{d}t$.

(i) Find $f(\pi/4)$.

(ii) Find $f'(\pi/3)$.

(iii) Find the length of the curve $y = f(x)$ from $x = \pi/4$ to $x = \pi/3$.

5. (20) Evaluate the following definite or indefinite integrals:

(i) $\displaystyle\int_0^1 \frac{\mathrm{d}x}{(x^2+1)^{3/2}}$,

(ii) $\displaystyle\int \frac{\sqrt{1-x^2}}{x^4}\,\mathrm{d}x$.

**Name:** _____

**Section:** _____

University of Colorado

Mathematics 2300: First Midterm Exam

February 6, 2008

*No calculators, formula sheets, notes or books are allowed.*
*Justify your answers. Correct answers with no justification may not receive full credit.*

| Problem | Points | Score |
|---|---|---|
| 1 | 20 | |
| 2 | 25 | |
| 3 | 15 | |
| 4 | 20 | |
| 5 | 20 | |
| Total | 100 | |