**Name:** _____ **Exam 2**

**Math 152, Calculus II – Crawford** **07 April 2015**

- No calculators, books, or notes (in any form) allowed.
- Clearly indicate your answers.
- ***Show all your work*** – partial credit may be given for written work.
- Evaluate trigonometric, exponential, and logarithmic expressions for standard values.
- Good Luck!

| Score | |
|---|---|
| 1 | /40 |
| 2 | /10 |
| 3 | /8 |
| 4 | /20 |
| 5 | /20 |
| 6 | /6 |
| Total | /100 |

Formulas that you may or may not find helpful

$$\sin^2\theta = \frac{1}{2} - \frac{1}{2}\cos 2\theta \qquad \cos^2\theta = \frac{1}{2} + \frac{1}{2}\cos 2\theta$$

$$\sin 2\theta = 2\sin\theta\cos\theta \qquad \cos 2\theta = \cos^2\theta - \sin^2\theta = 1 - 2\sin^2\theta = 2\cos^2\theta - 1$$

$$\sin A\cos B = \frac{1}{2}[\sin(A+B) + \sin(A-B)] = \frac{1}{2}\sin(A+B) + \frac{1}{2}\sin(A-B)$$

$$\cos A\cos B = \frac{1}{2}[\cos(A+B) + \cos(A-B)] = \frac{1}{2}\cos(A+B) + \frac{1}{2}\cos(A-B)$$

$$\sin A\sin B = \frac{1}{2}[\cos(A-B) - \cos(A+B)] = \frac{1}{2}\cos(A-B) - \frac{1}{2}\cos(A+B)$$

$$\sin(-\theta) = -\sin\theta \qquad \cos(-\theta) = \cos\theta$$

$$\int \sec\theta\, d\theta = \ln|\sec\theta + \tan\theta| \qquad \int \csc\theta\, d\theta = \ln|\csc\theta - \cot\theta|$$

$$\frac{1}{2}\Delta x\,[f(x_0) + 2f(x_1) + 2f(x_2) + 2f(x_3) + \cdots + 2f(x_{n-1}) + f(x_n)]$$

$$\frac{1}{3}\Delta x\,[f(x_0) + 4f(x_1) + 2f(x_2) + 4f(x_3) + \cdots + 2f(x_{n-2}) + 4f(x_{n-1}) + f(x_n)]$$

**1.** (40 pts). Evaluate the following integrals. Show all your work.

**(a).** $\int e^{3x} \sin(x)\, dx$

**(b).** $\int \frac{1}{x^2\sqrt{x^2+9}}\, dx$

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

**(d).** $\int \dfrac{x-1}{x^2(x+1)}\,dx$

**2.** (10 pts). Find the area bounded by $f(x) = x^2 \ln x$ on the interval $[1, e]$. [Simplify your answer.]

**3.** (8 pts). Use Simpson's Rule with $n = 6$ to approximate the integral $\displaystyle\int_2^5 \frac{1}{\ln x}\, dx$. [Do not simplify!!]

**4.** (20 pts). Evaluate the following integrals or show that it is a divergent improper integral.

**(a).** $\displaystyle\int_4^8 \frac{1}{\sqrt{x-4}}\,dx$

**(b).** $\displaystyle\int_{-\infty}^{\infty} x^3 e^{-x^4}\,dx$

**5.** (20 pts). Determine whether the following **sequences** converge or diverge. **If it converges, find the limit. If it diverges, clearly explain the reason why.** [Clearly indicate $+\infty$ or $-\infty$ in the case of an infinite limit.]

**(a).** $a_n = \dfrac{3n^2 + 2n - 1}{2 - 4n^2}$

**(b).** $a_n = 3 - (0.4)^n$

**(c).** $a_n = \dfrac{\sin n}{1 + n^2}$

**6.** (6 pts). *True or False.* Determine whether the following statements are true or false.

T F If $f(x) \le g(x)$ and $\displaystyle\int_0^\infty f(x)\,dx$ converges, then $\displaystyle\int_0^\infty g(x)\,dx$ also converges.

T F The fraction $\dfrac{2x^2 + x - 3}{x(2x+3)^3(x^2+1)} = \dfrac{A}{x} + \dfrac{B}{2x+3} + \dfrac{C}{2x+3} + \dfrac{D}{2x+3} + \dfrac{Ex+F}{x^2+1}$.

T F $\displaystyle\int \frac{\sqrt{x+1}}{x}\,dx = \int \frac{u}{u^2-1}\,du$ using the rationalizing substitution $u = \sqrt{x+1}$.