# Calculus II - Exam 2 - Techniques of Integration

March 21, 2013

**Name:**
**Honor Code Statement:**

**Additional Honor Statement:** I have not observed another violating the Honor Code._____

**Directions: Justify** all answers/solutions. Calculators are not permitted. You may use the table of trigonometric identities given on the last page. Each problem is worth 10 points. If you need extra space, use the blank white paper provided.

1. $\int_0^{2\pi} \sqrt{\frac{1-\cos 2x}{2}}\,dx$

2. $\int_1^e x^3 \ln x dx$

3. $\int e^{-2x} \sin(2x) dx$

4. $\int \frac{2x+1}{x^2-7x+12} dx$

5. $\int \frac{x^4}{x^2-1} dx$

6. $\int 35 \sin^4 x \cos^3 x dx$

7. $\int_0^{1/3} \sqrt{1-9t^2}dt$

Determine if the following integral converges.

8. $\int_{-\infty}^{2} \frac{2}{x^2+4} dx$

# Trigonometric Identities

### Addition and subtraction formulas

- $\sin(x+y) = \sin x \cos y + \cos x \sin y$
- $\sin(x-y) = \sin x \cos y - \cos x \sin y$
- $\cos(x+y) = \cos x \cos y - \sin x \sin y$
- $\cos(x-y) = \cos x \cos y + \sin x \sin y$
- $\tan(x+y) = \frac{\tan x + \tan y}{1 - \tan x \tan y}$
- $\tan(x-y) = \frac{\tan x - \tan y}{1 + \tan x \tan y}$

### Double-angle formulas

- $\sin(2x) = 2\sin x \cos x$
- $\cos(2x) = \cos^2 x - \sin^2 x = 2\cos^2 x - 1 = 1 - 2\sin^2 x$
- $\tan(2x) = \frac{2\tan x}{1 - \tan^2 x}$

### Half-angle formulas

- $\sin^2 x = \frac{1 - \cos(2x)}{2}$
- $\cos^2 x = \frac{1 + \cos(2x)}{2}$

### Others

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