Exam 2

Name: _____

Each problem is worth the indicated number of points. Show all your work for full credit; numerical or graphical estimates are unacceptable unless specifically requested. You may work one bonus problem; if you work more than one I will only grade the first one.

1. (20 pts) Find the indefinite integral:

$$\int \frac{x^4 + x^3 + 4x^2 + 3x + 4}{x^5 + 4x^3 + 4x} \mathrm{d}x$$

2. (10 pts) Find the definite integral:

$$\int_{-1}^{1} \frac{1}{\sqrt[3]{x}} \mathrm{d}x$$

3. (15 pts) Find the indefinite integral:

$$\int \sin x \cos x \mathrm{d}x$$

(a) Using integration by parts

(b) By using a double angle formula

Use trigonometric identities to check that your answers agree.

4. (15 pts) Find the indefinite integral:

$$\int \sin^4\theta \cos^3\theta \mathrm{d}\theta$$

5. (15 pts) Find the definite integral:

$$\int_0^8 \sqrt{1+x^2}\mathrm{d}x$$

6. (10 pts) Use Simpson's Rule with $n = 4$ to approximate

$$\int_0^8 \sqrt{1+x^2}\mathrm{d}x$$

7. (15 pts) Find the area inside the curve given in polar coordinates by $r = \sin(2\theta)$

8. (Bonus 10 pts) Prove the reduction formula:

$$\int \sec^n x \mathrm{d}x = \frac{1}{n-1} \tan x \sec^{n-2} x + \frac{n-2}{n-1} \int \sec^{n-2} x \mathrm{d}x$$

9. (Bonus 10 pts) Determine whether the integral is convergent:

$$\int_{100}^{\infty} \frac{1}{\ln\left(\ln\left(\ln\left(x\right)\right)\right)} \mathrm{d}x$$