Show all your work and give reasons for your answers. Good luck!

Part I

In part I essentially no partial credit is awarded. Hence work these problems carefully. Each problem in part I is 9 points.

In 1-6, evaluate the integrals:

1. \( \int \frac{x^7-x}{\sqrt{x}} \, dx \)

2. \( \int x \sin(x) \, dx \)

3. \( \int x^3(2x^4 + 1)^{30} \, dx \)

4. \( \int \frac{1}{x^4-1} \, dx \)
(5) \( \int_{0}^{1} \arctan(x) \, dx \)

(6) \( \int \sin^3(x) \cos^7(x) \, dx \)

(7) Use a Riemann sum with \( n = 3 \) terms and the mid-point rule to estimate the value of \( \int_{3}^{4} \sin(x^3) \, dx \). (You do not need to evaluate the sine of a number and can leave your answer as a sum.)

(8) Given \( F(x) = \int_{1}^{x^2} \sqrt{1 + t^2} \, dt \), find \( F'(x) \).
Part II

In part II you can receive partial credit. Each problem in Part II counts for 14 points.

Evaluate the following integrals:

(9) \[ \int \frac{1}{x^3 + 2x^2 + x} \, dx \]

(10) \[ \int \cos^4(x) \, dx \]
Bonus problem

(11) \[ \int \frac{x}{\sqrt{x(x+1)}} \, dx \]
Show all your work and give reasons for your answers. Good luck!

**Part I**

In part I essentially no partial credit is awarded. Hence work these problems carefully. Each problem in part I is 9 points.

(1) \[ \int \sqrt[3]{x} (x^5 + 1) \, dx \]

(2) \[ \int xe^x \, dx \]

(3) \[ \int \frac{x^4}{(3x^5 + 6)^{20}} \, dx \]

(4) \[ \int \frac{1}{(x+1)(x-2)} \, dx \]
(5) \( \int_{0}^{1/2} \arcsin(x) \, dx \)

(6) \( \int \sin^7(x) \cos^3(x) \, dx \)

(7) Use a Riemann sum with \( n = 3 \) terms and the mid-point rule to estimate the value of \( \int_{5}^{6} \tan(x^4) \, dx \). (You do not need to evaluate the tangent of a number and you can leave your answer as a sum.)

(8) Given \( F(x) = \int_{2}^{x^4} \sin(1 + t^2) \, dt \), find \( F'(x) \).
Part II

In part II you can receive partial credit. Each problem in Part II counts for 14 points.
Evaluate the following integrals:

(9) \( \int \frac{1}{x^2 + x} \, dx \)

(10) \( \int \sin^4(x) \, dx \)
Bonus Problem

(11) $\int \sin(\sqrt{x}) \, dx$