

Name: _____

4-digit code: _____

- Write your name and the last 4 digits of your SSN in the space provided above.
- The test has five (5) pages, including this one.
- Enter your answer in the box(es) provided.
- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given in parentheses at the right of the problem number.
- No books, notes or calculators may be used on this test.

Page	Max. points	Your points
2	25	
3	30	
4	20	
5	25	
Total	100	

Problem 1 (25 pts). Evaluate each integral:

(a) $\int_0^2 \left(5x + \frac{2}{3x^5} - \sqrt{2}e^x\right) dx$

(b) $\int (3 \sin x - 2 \sec^2 x) dx$

(c) $\int (1 + \sin t)^{90} \cos t dt$

(d) $\int_0^1 \frac{5x^4}{(x^5 + 1)^2} dx$

(e) $\int \frac{3x - 2}{(x - 1)(x + 1)^2} dx$

Problem 2 (20 pts). Express the following functions of n in closed form and then find the limit.

(a) $\lim_{n \rightarrow \infty} \frac{1^2 + 2^2 + 3^2 + \cdots + n^2}{n^3}$

(b) $\lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{5k}{n^2}$

Problem 3 (10 pts). Use the definition of **definite integral** to express $\int_{-\pi/2}^{\pi/2} (1 + \cos x) dx$ as a limit.

Problem 4 (10 pts). Use the Fundamental Theorem of Calculus to find the derivative of the following functions.

(a) $g(x) = \int_1^x \frac{1}{t^3 + 1} dt$

$g'(x) =$

(b) $g(y) = \int_x^\pi \sqrt{1 + \sec t} dt$

$g'(y) =$

Problem 5 (10 pts). Find the antiderivative F of $f(x) = 4 - 3(1 + x^2)^{-1}$ that satisfies $F(1) = 0$.

$F(x) =$

Problem 6 (25 pts). Sketch the region enclosed by the curves $y = x^2$, $y = 4x - x^2$, and find the corresponding area.

Area: