ONLY THE CORRECT ANSWER AND ALL WORK USED TO REACH IT WILL EARN FULL CREDIT.

Simplify all answers as much as possible unless explicitly stated otherwise.

This is a closed-book, closed-notes exam. No electronic devices are allowed.

IF YOUR SECTION NUMBER IS MISSING OR INCORRECT, 5 POINTS WILL BE DEDUCTED FROM YOUR SCORE.

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Total Score:

FORMULAS

\[ \sum_{k=1}^{n} 1 = n \quad \sum_{k=1}^{n} k = \frac{n(n+1)}{2} \]

\[ \sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6} \quad \sum_{k=1}^{n} k^3 = \left[ \frac{n(n+1)}{2} \right]^2 \]
Evaluate the following indefinite integrals by any method. (7 points each.)

(1) \( \int \left( 5x^{1/4} + \frac{1}{x^{3/4}} \right) dx \)

(2) \( \int \frac{t}{3-5t^2} dt \)

(3) \( \int \frac{\sec^2(\sqrt{y})}{\sqrt{y}} dy \)

(4) \( \int \frac{e^x}{\sqrt{1-e^{2x}}} dx \)
Evaluate the following definite integrals by any method. (7 points each.)

(5) \[ \int_0^\pi \cos t \, dt \]

(6) \[ \int_2^8 \sqrt{9 - (x - 5)^2} \, dx \]

(7) \[ \int_0^{\pi/6} \frac{\tan y}{\cos y} \, dy \]

(8) \[ \int_0^{1/2} \frac{1}{1+4x^2} \, dx \]
(9) (7 points.) Write the sum $1 - 3 + 5 - 7 + 9 - 11$ in sigma notation.

(10) (7 points.) **Approximate** the area between the graph of $y = \sin x$ and the $x$-axis over the interval $[0, \pi]$, dividing the interval into $n = 3$ subintervals, and choosing $x_k^*$ to be the **right endpoint** of each subinterval.
(11) (8 points.) Let \( f(x) \) be differentiable, let \( \int_1^2 f(x)\,dx = 4 \), and let \( \int_1^5 f(x)\,dx = 7 \). Evaluate the following.

(a) \( \int f'(x)\,dx \)

(b) \( \int_2^5 f(x)\,dx \)

(c) \( \int_5^1 f(x)\,dx \)

(12) (6 points.) Let \( F(x) = \int_2^x \ln(t)\,dt \). Evaluate the following.

(a) \( F(2) \)

(b) \( F'(2) \)

(c) \( F''(2) \)
(11) (8 points.) Let \( f(x) \) be differentiable, let \( \int_{1}^{2} f(x)\,dx = 1 \), and let \( \int_{1}^{5} f(x)\,dx = 10 \). Evaluate the following.

(a) \( \int f'(x)\,dx \)

(b) \( \int_{2}^{5} f(x)\,dx \)

(c) \( \int_{5}^{1} f(x)\,dx \)

(12) (6 points.) Let \( F(x) = \int_{2}^{x} \sqrt{t}\,dt \). Evaluate the following.

(a) \( F(2) \)

(b) \( F'(2) \)

(c) \( F''(2) \)
(13) (8 points.) Evaluate the definite integral \( \int_{-2}^{1} (3 + |x|) \, dx \) by any method.
(14) (a) (4 points.) Write the exact area between the graph of \( y = x(2 - x) \) and the \( x \)-axis over the interval \([0, 1]\) as the limit of a Riemann sum with \( x_k^* \) as the right endpoint of each subinterval. Make all of your subintervals of equal length. You need not evaluate the limit. You do not need to put the sum in closed form.

(b) (4 points.) Find the exact area between the graph of \( y = x(2 - x) \) and the \( x \)-axis over the interval \([0, 1]\), by any method.