

MATH 1650
Exam 3 – Ver A
Fall 2024

Student name: _____
Recitation instructor: _____
Section: _____

This exam is closed book and closed notes. No electronic devices, calculators, headphones, or smart watches are allowed.

There are two sections:

Section 1 – Multiple-Choice: 5-points each, No partial credit

Section 2 – Work-Out: 10-points each, Partial credit possible

SCORES

SECTION 1: Multiple-Choice

1–6	
Total	

SECTION 2: Work-Out

7	
8	
9	
10	

DO NOT BEGIN THIS EXAM UNTIL INSTRUCTED TO START

Do not write
in these boxes →
on the exam

score

Section 1 – Multiple-Choice Clearly circle one choice for each question. More than one circled answer will be considered incorrect. Space is provided for work, but no work will be graded. Each question is worth 5 points with no partial credit.

1. Apply Newton's Method to estimate a root of $f(x) = x^3 - 5x + 1$. If $x_0 = 1$, what is x_1 ?

A. $x_1 = -\frac{3}{2}$

B. $x_1 = -\frac{1}{2}$

C. $x_1 = \frac{1}{3}$

D. $x_1 = \frac{5}{3}$

E. $x_1 = \frac{5}{2}$

score

2. Use a *midpoint* Riemann sum with *three* equal subintervals to estimate

$$\int_0^6 (x^2 - 3x) \, dx.$$

A. 4

B. 8

C. 16

D. 18

E. 20

score

3. Compute $\sum_{n=0}^8 (2n + 5)$. If needed, you may use the formulas

$$\sum_{n=1}^k n = \frac{k(k+1)}{2}$$

$$\sum_{n=1}^k n^2 = \frac{k(k+1)(2k+1)}{6}.$$

- A. 79
- B. 96
- C. 101
- D. 112
- E. 117

score

4. Find the value of c that satisfies the Mean Value Theorem for derivatives with the function $f(x) = \frac{1}{x-3}$ on the interval $[4, 12]$.

- A. 6
- B. 7
- C. 8
- D. 9
- E. 10

score

5. Find $\int \frac{x}{x^2 + 1} dx$.

A. $\frac{1}{2} \ln(x^2 + 1) + C$

B. $\ln(x^2 + 1) + C$

C. $2 \ln(x^2 + 1) + C$

D. $\arctan(x) + C$

E. $\frac{1}{2}x^2 \arctan(x) + C$

score

6. Find $\int_{e^2}^{e^6} \frac{1}{x \ln x} dx$.

A. $\ln 3$

B. $\ln 4$

C. 4

D. $4 + \ln 3$

E. 16

score

Section 2 – Work-Out Answer each question completely using exact values. You do not need to simplify your answers unless otherwise indicated. Show all steps neatly and legibly. Include correct notation. **Answers without work and/or justifications will not receive full credit.** Clearly indicate your final answer for each problem. Each problem is worth 10 points. Partial credit is possible.

7. Compute the following limits.

a) (4 points)

$$\lim_{x \rightarrow 0} \frac{(x-1)^2 - \cos(x)}{e^x - 1}$$

b) (6 points)

$$\lim_{t \rightarrow \infty} \left(1 + \frac{2}{t}\right)^t$$

score

8. Find the indefinite integrals (5 points each).

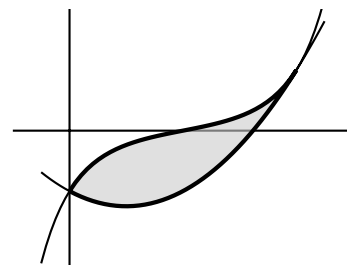
a) $\int \frac{3x^4}{x^2 + x^5} dx$

b) $\int \frac{1 + x \cos x}{x} dx$

score

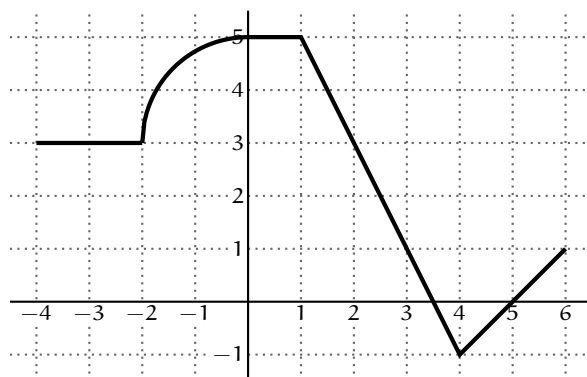
9. Find the area between the curves $f(x) = (x - 1)e^{x^2 - 2x}$ and $g(x) = x^2 - x - 1$.
(The shaded region in the picture below.)
Simplify your answer as much as possible.

Hint: the two curves intersect in exactly two points, both of which have integer values.



score

10. Let $f(t)$, defined for $-4 \leq t \leq 6$, be shown in the graph where the curved portion is a quarter circle having radius 2 and center $(0, 3)$. Define a new function $F(x) = \int_1^x f(t) dt$.



a) (3 points) Find $F(5)$.

b) (3 points) Find $F(-3)$.

c) (4 points) Let $H(x) = F(g(x))$ where $g(x) = 8 - 2x$. Find $H'(3)$.

score