

MTH 1125-Final Exam- A1

Exam time: 120 minutes

Date: June 10, 2026

NAME:

STUDENT ID NUMBER (Troy ID):

General instructions:

- No discussion is allowed in the exam room.
- No electronic devices (except calculator) are allowed.

PROBLEM	POINTS	SCORE
A1	4	
A2	4	
A3	4	
A4	4	
A5	4	
A6	4	
A7	4	
A8	4	
A9	4	
A10	4	
B1	10	
B2	15	
B3	15	
B4	10	
B5	10	
TOTAL	100	

PART A: Multiple choice or Short answer

(4 mark for each correct answer/choice)

A1. The greatest integer function is defined by $[[x]]$ the largest integer that is less than or equal to x . Find the average value of the function $f(x) = [[x + 1]]$ on the interval $[-1, 1]$.

Write your exact answer here:

A2. Find an equation of the slant asymptote of the curve

$$y = \frac{3x^4 - 3x^3 + x - 3}{x^3 - 5x}$$

Write yours answer here:

A3. If 2700 cm^2 of material is available to make a box with a square base and an open top, find the largest possible volume of the box.

Write your answer here:

A4. Let $f(x) = \int_0^x (1 - t^2)e^{t^2} dt$. Evaluate $f'(0) = ?$

Circle the best answer.

A. 3

B. 1

C. 0

D. A,B,C are incorrect.

A5. Find all vertical asymptotes of $y = \frac{x^4 - 4x^2}{(x^2 - 1)(x + 2)}$.

Write yours answer here:

A6. Evaluate the indefinite integral $\int x e^{-x^2} dx$.

Write yours answer here:

A7. When a particle is located a distance x meters from the origin, a force of $2 \cos(\pi x) + 3$ newtons acts on it. How much work is done in moving the particle from $x = 0$ to $x = 1$?

Write the exact value here:

A8. Let m be a positive integer. Evaluate

$$\lim_{x \rightarrow \infty} (e^x + 1)^{\frac{m}{x}}$$

Write the exact value here:

A9. A bacteria culture grows with constant relative growth rate. The bacteria count was 400 after 2 hours and 3600 after 4 hours Find the number of cells after 5 hours

Circle the best answer.

A. 9500

B. 10800

C. 12000

D. A,B,C are incorrect

A10. Let R be the bounded region by $y = x - x^5$, $y = 0$, $0 \leq x \leq 1$. Find the volume of the solid obtained by rotating R about y-axis.

Write the exact value here:

PART B: WRITE YOUR FULL ANSWERS.

B1. The position of a particle is given by the equation

$$s = f(t) = t^2 - 6t + 3$$

where s is measured in seconds and in meters.

(a) When is the particle at rest? When is the particle moving forward (that is, in the positive direction)?

(b) Find the total distance traveled by the particle during the first five seconds

B2. (a) Evaluate the Riemann sum for $f(x) = x^2 - 2x + 4$, taking the sample points to be left endpoints and $a = 0$, $b = 3$, and $n = 6$.

(b) Evaluate the Riemann sum for $f(x) = x^2 - 2x + 4$, taking the sample points to be the midpoints and $a = 0$, $b = 3$, and $n = 6$.

(c) Find $\int_0^3 f(x)dx$ via the limit of Riemann sum.

B3. (a) Sketch the bounded region R enclosed by the given curves and find its area: $y = x^2$ and $y = 3x$.

(b) Find the volume of the solid obtained by rotating R about $y = 3$.

(c) Find the volume of the solid obtained by rotating R about y-axis.

B4. Evaluate

$$\lim_{n \rightarrow \infty} \left(\frac{1}{\sqrt{2n^2+3n}} + \frac{1}{\sqrt{2n^2+6n}} + \cdots + \frac{1}{n\sqrt{5}} \right)$$

B5. Use the Mean Value Theorem to prove the inequality

$$|\sin x - \sin y| \leq |x - y|, \quad \forall x, y.$$

-----Good luck-----

Start to write you solution (Part B).