

Emory University
Exam # 3 Review Sheet
MA-111 Calculus I
Date: November 14, 2025
Instructor: Mitchell Scott

Student ID _____

Name: _____

Please read the following instructions carefully.

- You have 90 minutes to complete this exam. This question booklet contains 4 questions, 10 pages (including the cover) for the total of 108 points/marks. Check to see if any pages are missing. DO NOT scribble or do rough work or make any stray marks on it. Use separate sheet for rough work.
- All the questions are compulsory and all the notations have their usual meaning. You can use standard results directly by writing its statement appropriately. **Read the instructions for individual questions carefully** before answering the questions.
- More instructions here.

Question	Points	Score
1	27	
2	27	
3	27	
4	27	
Total:	108	

1. This problem will guide you through the steps to sketch the graph of the following function:

$$f(x) = \frac{e^x}{(x+2)^2}.$$

(a) (2 points) What is the domain of $f(x)$?

(b) (2 points) Find the y -intercept of $f(x)$

(c) (2 points) Find the x -intercept of $f(x)$, if there is one.

(d) (2 points) Does $f(x)$ have any discontinuities? If so, what kind and where?

(e) (2 points) What are the horizontal asymptotes of $f(x)$?

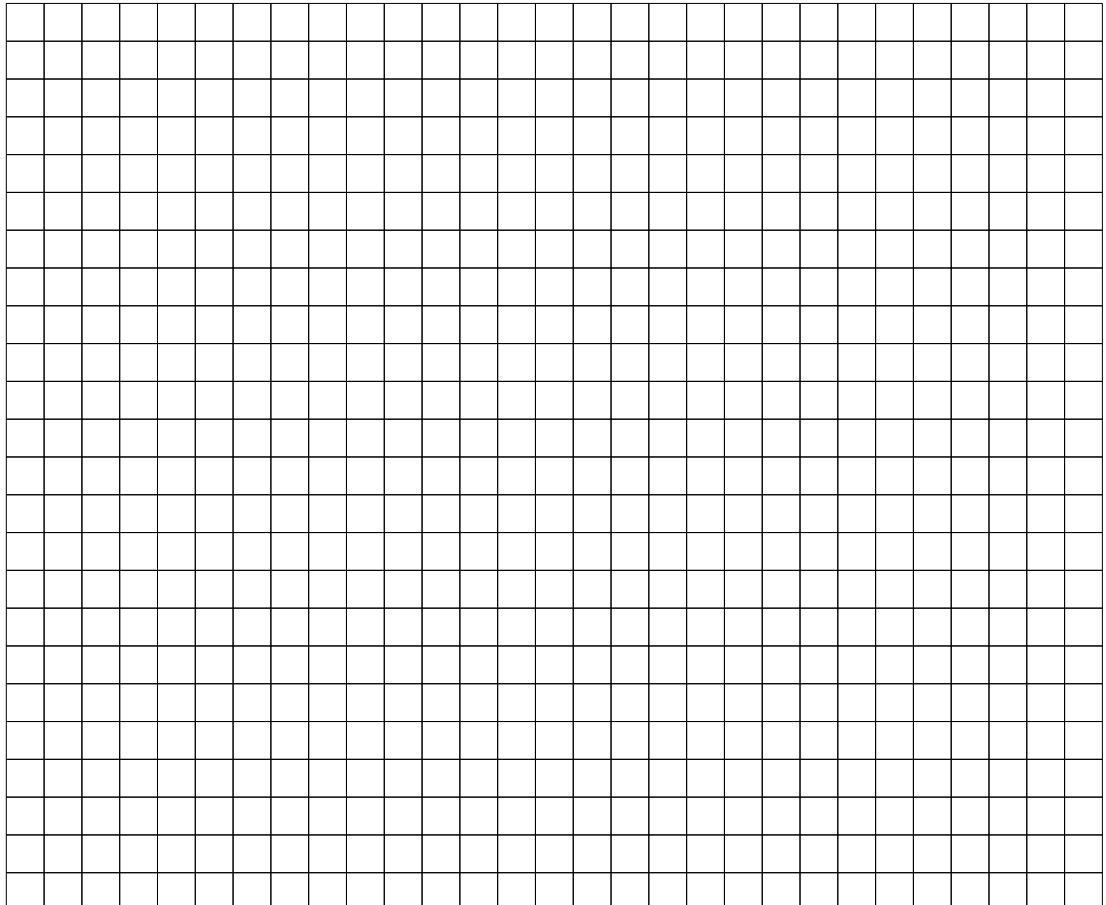
Workspace:

- ☐ Only $f(x) = 0$
- ☐ Only $f(x) = \infty$
- ☐ Both $f(x) = 0$ and $f(x) = \infty$
- ☐ This function has no horizontal asymptotes.

(f) (2 points) Make a sign chart of the **first derivative**. What does it tell you about f ?

- (g) (1 point) Find the point $(x, f(x))$ that is a *local minimum*.
- (h) (1 point) Find the point $(x, f(x))$ that is a *local maximum*.
- (i) (3 points) Make a sign chart of the **second derivative**. What does it tell you about f ? Are there any points of inflection?
- (j) (10 points) Using the information from the previous parts, sketch the graph of the function:

$$f(x) = \frac{e^x}{(x+2)^2}$$



2. This problem will guide you through the steps to sketch the graph of the following function:

$$g(x) = \frac{1}{6}x^3 + \frac{1}{2}x^2 + 3$$

(a) (2 points) What is the domain of $g(x)$?

(b) (2 points) Find the y -intercept of $g(x)$

(c) (2 points) Find the x -intercept of $g(x)$, if there is one.

(d) (2 points) Does $g(x)$ have any discontinuities? If so, what kind and where?

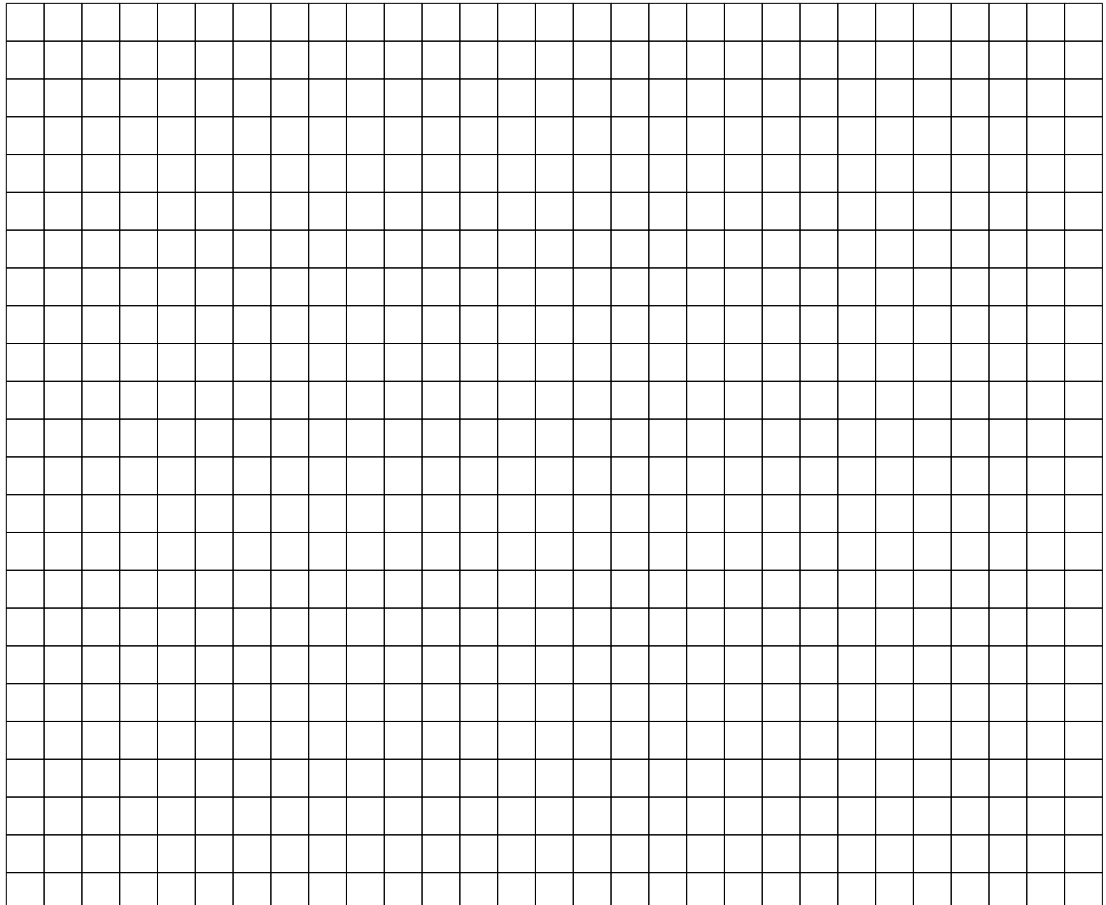
(e) (2 points) What are the horizontal asymptotes of $g(x)$?
Workspace:

- ☐ Only $g(x) = 0$
- ☐ Only $g(x) = \infty$
- ☐ Both $g(x) = 0$ and $g(x) = \infty$
- ☐ This function has no horizontal asymptotes.

(f) (2 points) Make a sign chart of the **first derivative**. What does it tell you about g ?

- (g) (1 point) Find the point $(x, g(x))$ that is a *local minimum*.
- (h) (1 point) Find the point $(x, g(x))$ that is a *local maximum*.
- (i) (3 points) Make a sign chart of the **second derivative**. What does it tell you about g ? Are there any points of inflection?
- (j) (10 points) Using the information from the previous parts, sketch the graph of the function:

$$g(x) = \frac{1}{6}x^3 + \frac{1}{2}x^2 + 3$$



3. This problem will guide you through the steps to sketch the graph of the following function:

$$h(x) = \frac{x^2 - x - 2}{x^2 - x - 6}.$$

(a) (2 points) What is the domain of $h(x)$?

(b) (2 points) Find the y -intercept of $h(x)$

(c) (2 points) Find the x -intercept of $h(x)$, if there is one.

(d) (2 points) Does $h(x)$ have any discontinuities? If so, what kind and where?

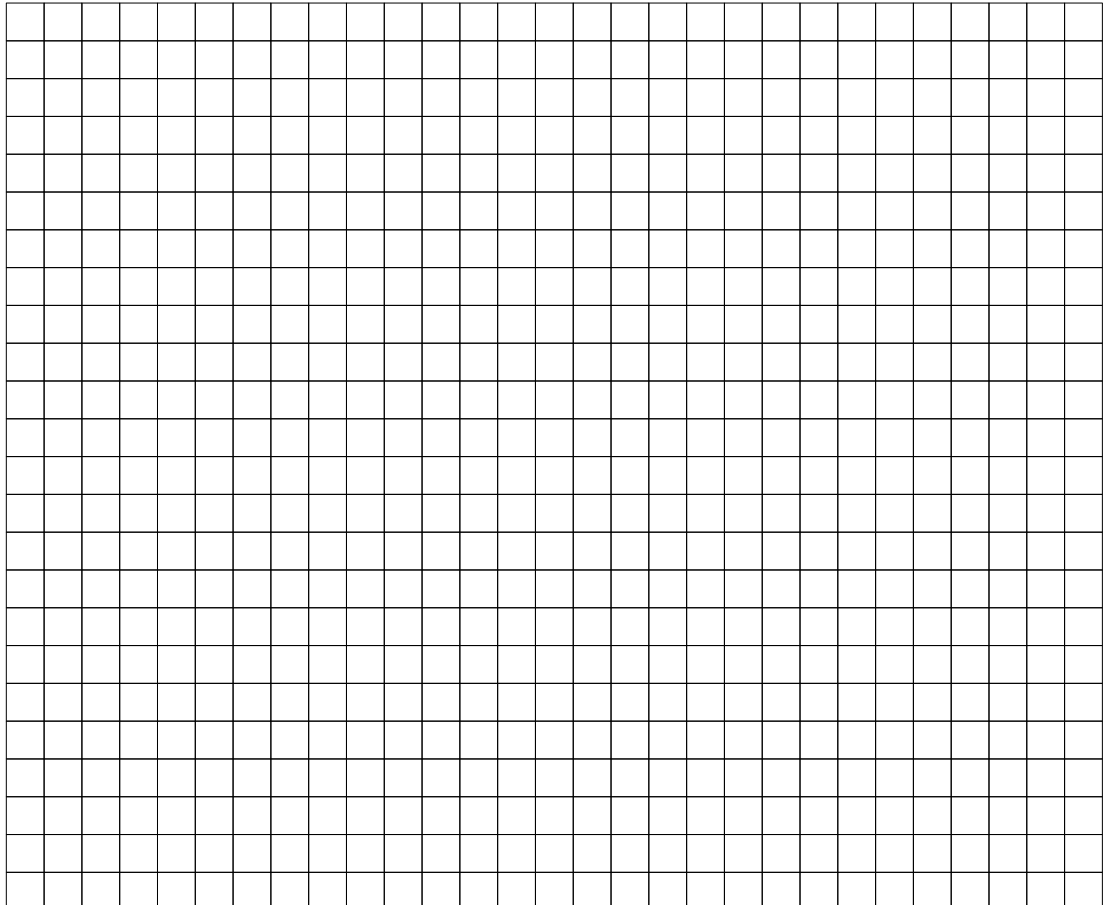
(e) (2 points) What are the horizontal asymptotes of $h(x)$?
Workspace:

- ☐ Only $h(x) = \infty$
- ☐ Only $h(x) = 1$
- ☐ Both $h(x) = 0$ and $h(x) = \infty$
- ☐ This function has no horizontal asymptotes.

(f) (2 points) Make a sign chart of the **first derivative**. What does it tell you about h ?

- (g) (1 point) Find the point $(x, h(x))$ that is a *local minimum*.
- (h) (1 point) Find the point $(x, h(x))$ that is a *local maximum*.
- (i) (3 points) Make a sign chart of the **second derivative**. What does it tell you about h ? Are there any points of inflection?
- (j) (10 points) Using the information from the previous parts, sketch the graph of the function:

$$h(x) = \frac{x^2 - x - 2}{x^2 - x - 6}$$



4. This problem will guide you through the steps to sketch the graph of the following function:

$$j(t) = \frac{t^3 - t^2 + 1}{e^t}$$

(a) (2 points) What is the domain of $j(t)$?

(b) (2 points) Find the y -intercept of $j(t)$

(c) (2 points) Find the t -intercept of $j(t)$, if there is one.

(d) (2 points) Does $j(t)$ have any discontinuities? If so, what kind and where?

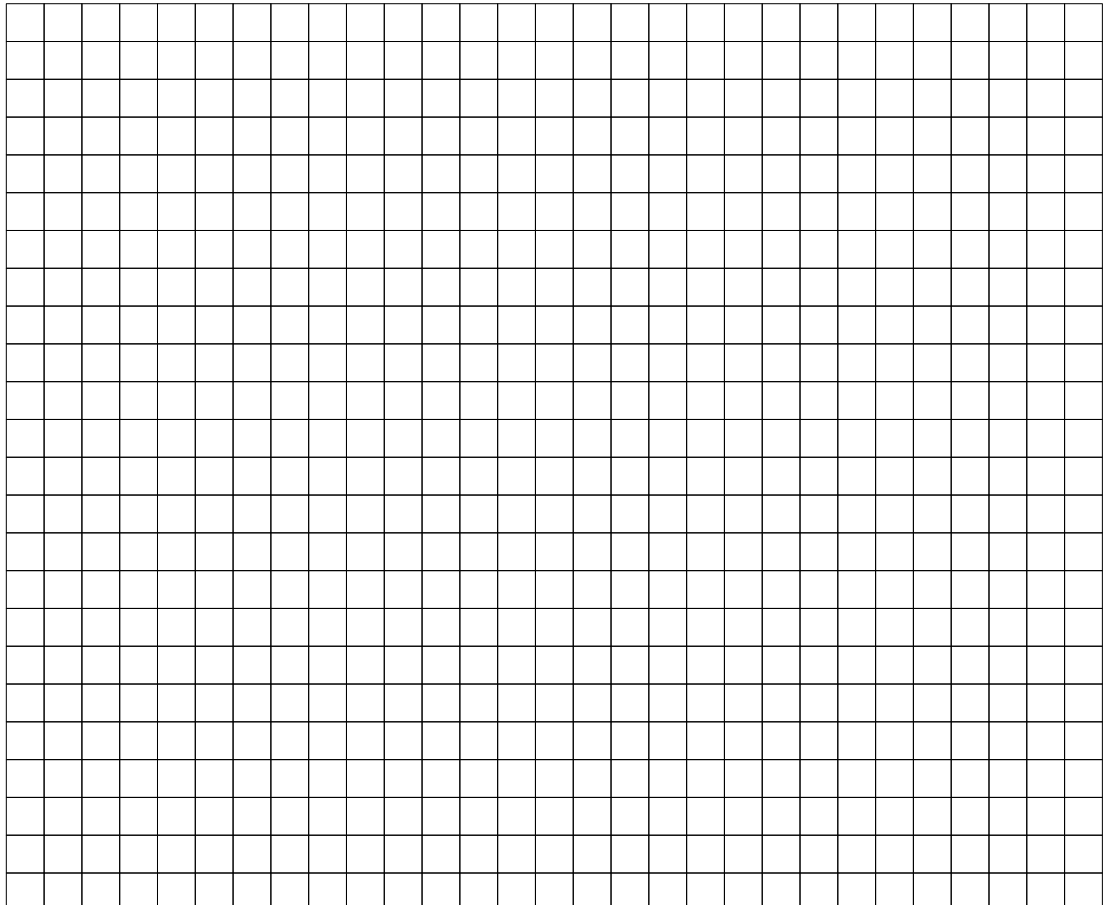
(e) (2 points) What are the horizontal asymptotes of $j(t)$?
Workspace:

- ☐ Only $j(t) = 0$
- ☐ Only $j(t) = \infty$
- ☐ Both $j(t) = 0$ and $j(t) = \infty$
- ☐ This function has no horizontal asymptotes.

(f) (2 points) Make a sign chart of the **first derivative**. What does it tell you about j ?

- (g) (1 point) Find the point $(t, j(t))$ that is a *local minimum*.
- (h) (1 point) Find the point $(t, j(t))$ that is a *local maximum*.
- (i) (3 points) Make a sign chart of the **second derivative**. What does it tell you about f ? Are there any points of inflection?
- (j) (10 points) Using the information from the previous parts, sketch the graph of the function:

$$j(t) = \frac{t^3 - t^2 + 1}{e^t}$$



Extra grid paper:

