Division of Science **The City College of New York** **Department of Mathematics**

MATH195 – Precalculus

Fall 2024 Exam Two
Date: October 24th, 2024

First Name: _____ Last Name: _____

EMPLID: _____

Directions:

- **NO** notes, calculators, or other electronic devices allowed.
  All electronic devices must be turned off and placed out of sight or they will be confiscated for the duration of the exam.
- Read each problem carefully. Unless otherwise instructed, be sure to show your work.
- Remember that it is your **responsibility** to answer each question clearly and in a way that convinces the grader that you understand how to solve each problem.

– GOOD LUCK!

Answer all 7 questions. **You must show all of your work** as neatly and clearly as possible and indicate the final answer in the provided region for each non-graph question. For all graph questions, you should sketch your graph on the grid provided.

1. (10 points) Let $P(x) = x^3 - 2x^2 - 3x$.

(a) (4 points) Find the zeros of $P(x)$.

Write your answer in the box below:

$x =$

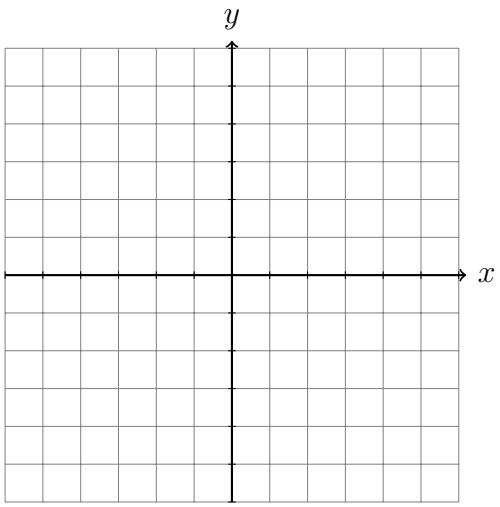
(b) (2 points) What is the end behavior of $P(x)$? Enter your answer using the arrow ($\rightarrow$) notation. Write your answer in the box below:

If $x \rightarrow \infty$, $f(x) \rightarrow$ _____

If $x \rightarrow -\infty$, $f(x) \rightarrow$ _____

□

(c) (4 points) Using the information from the previous part, make a rough sketch of the graph of $P(x)$. Label the intercepts on your graph.



2. (10 points) Let $P(x) = 4x^3 - 3x^2 - 8x + 4$.

(a) (5 points) Use the Remainder Theorem to find the remainder when $P(x)$ is divided by $x - 2$.

Note: If you don't use the Remainder Theorem to find the remainder, you will receive zero credit.

Write your answer in the box below:

The remainder is:

(b) (5 points) Use the Factor Theorem to determine whether $x - 2$ is a factor of $P(x)$. Select an answer and write it on the line.

A. $x - 2$ is a factor of $P(x)$

B. $x - 2$ is not a factor of $P(x)$

C. The Factor Theorem cannot be applied here

(b) _____

3. (10 points) Let $P(x) = x^3 + 2x^2 - x + 1$. Find the quotient and remainder when $P(x)$ is divided by $x + 3$. Express your answer in the form $\frac{P(x)}{D(x)} = Q(x) + \frac{R(x)}{D(x)}$.

Write your answer in the box below:

$\frac{P(x)}{D(x)} =$

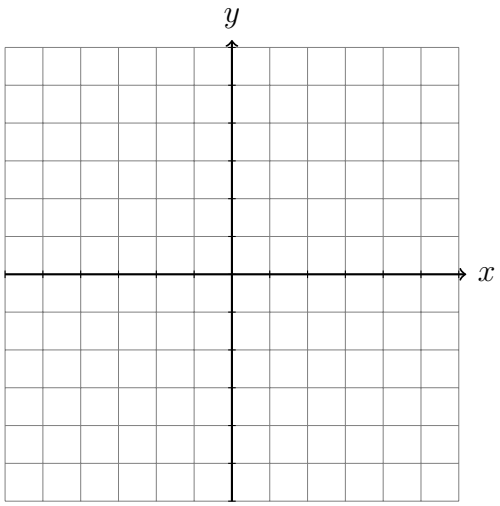
4. (14 points) Let $f(x) = e^x + 2$

(a) (2 points) Find the range of f. Write your answer in interval notation.

Write your answer using interval notation:

Range of $f(x)$:

(b) (4 points) Graph f on the grid below. Label the horizontal asymptote and intercepts on your graph.



(c) (4 points) Find f^{-1}, the inverse of f. State the domain and range of f^{-1} in interval notation.

Write your answer in the box below:

$f^{-1}(x) =$ Domain: Range:

(d) (4 points) Graph $f^{-1}(x)$ on the grid below. Label the vertical asymptote and intercepts on your graph.