Suffolk County Community College

Michael J. Grant Campus

Department of Mathematics

Wednesday, December 18, 2023 — Make-up Version

MAT 111
Algebra-II

Final Exam

Instructor:

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Please print the requested information in the spaces provided:

Student:

Name:

Student Id:

Email: *include to receive the final grade via email* ONLY *if you are not getting email updates*

- *Any violation of academic integrity on this exam will result in a failing grade for the whole course.*
- *Notes and books are permitted, but cannot be shared.*
- *Graphing calculators, smartwatches, computers, cell phones and any other communication-capable devices are prohibited. Their mere presence in the open — even without use — is a violation of academic integrity.*
- *You will not receive full credit if there is no work shown, even if you have the right answer. Please don't attach additional pieces of paper: if you run out of space, please ask for another blank final.*

Problem 1. In this problem we will, through a series of sub-problems, solve the system of equations

$$\begin{cases} 2x + 7y + 2z = -9 \\ 3x + 11y - 2z = 8 \\ 8x + 29y - 3z = 11 \end{cases}$$

using Gauß-Jordan method. Any other solution will not be accepted, so please keep your work relevant to the specific question being asked in each sub-problem.

(1). Write the augmented matrix of this system of equations.

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(2). Find elementary row transformations that would make the top left corner of the augmented matrix equal to 1, while avoiding any fractions in the resulting matrix. Perform these transformations and make them explicit by using the R_i notation.

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(3). Add multiples of the first row to the second and third row (as needed) to make the first column entries of these two rows equal to zero. Make your row transformations explicit by using the R_i notation.

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(4). Use elementary row transformations to turn the matrix into the so-called *row echelon form* by making all entries on the diagonal equal to 1 and all entries below the diagonal equal to 0. Make the row transformations explicit by using the R_i notation.

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(5). Use elementary row transformations to turn into zero all entries above the leader of the third row. Make the row transformations explicit by using the R_i notation.

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(6). Use elementary row transformations to turn into zero all entries above the leader of the second row. Make the row transformations explicit by using the R_i notation.

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(7). Based on the answer to the previous sub-problem, determine the solution of the original system:

$$\begin{cases} x = \\ y = \\ z = \end{cases}$$

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Problem 2. Solve the inequality:

$$2x + |3x - 5| \geq 10.$$

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Problem 3. Consider the quadratic polynomial $-5x^2 + 7x + 1$.

(1). Perform the completion of the square.

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(2). Sketch the graph of the function $y = f(x)$ on the (x, y)-coordinate plane by transforming the graph of $y = x^2$.

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(3). Use the result of completion of the square to find the vertex of the parabola, and mark it on the sketch in sub-problem 2.

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(4). Use the completion of the square in the first sub-problem, and the difference-of-two-squares formula, to find the roots of the polynomial. Mark the on the sketch in sub-problem 2, adjusting that sketch, if necessary.

Space for your solution: