Suffolk County Community College

**Michael J. Grant Campus**

# Department of Mathematics

**Thursday, December 5, 2024 (returned Tuesday, December 10, 2024)**

# MAT 129
# College Precalculus

## 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*

- *Notes and books are permitted on this exam.*
- *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 sufficient reason for an immediate dismissal from this exam with a failing grade.*
- *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.** Suppose
set $A = \{\text{Paris}, \text{Ottawa}, \text{Toronto}, \text{Berlin}, \text{Madrid}\}$ and
set $B = \{\text{Canada}, \text{France}, \text{Germany}, \text{Spain}\}$. Define a function "`Country`" to have domain $A$, range $B$ and graph

$\{(\text{Paris}, \text{France}), (\text{Ottawa}, \text{Canada}), (\text{Toronto}, \text{Canada}), (\text{Berlin}, \text{Germany}), (\text{Madrid}, \text{Spain})\}$.

**(1).** What is `Country`(Berlin)?

*Space for your solution:*

**(2).** What is the image of the function `Country`?

*Space for your solution:*

**(3).** Can the function `Country` be inverted? If yes, find the domain, range and graph of the inverse. If no, explain why.

*Space for your solution:*

**Problem 2.** Consider the function with the range $\mathbb{R}$, defined by the formula

$$f(x) = \frac{2x^3 - 5x^2 + 7}{x^2 - 4x + 4}$$

for all $x \in \mathbb{R}$, for which the above formula makes sense.

**(1).** What is the domain of the function $f$?

*Space for your solution:*

**(2).** Find all the vertical asymptotes of the graph of $f(x)$.

*Space for your solution:*

**(3).** Find the $y$-intercept of $f(x)$.

*Space for your solution:*

**(4).** Perform long division of the numerator of $f(x)$ by its denominator. Using the results of the long division, write $f(x)$ as a sum of a polynomial and a proper fraction.

*Space for your solution:*

**(5).** Find the equation of the oblique asymptote of $f(x)$.

*Space for your solution:*

**(6).** Find all the intersections of the graph of $f(x)$ with the oblique asymptote. (Only the $x$-coordinates of the intersections are needed.)

*Space for your solution:*

**(7).** Use the Rational Roots Theorem to find a rational root of $2x^3 - 5x^2 + 7$.

*Space for your solution:*

**(8).** Use the result of the previous subproblem to find all $x$-intercepts of the funciton $f(x)$.

*Space for your solution:*

**(9).** Use the result of the previous sub-problems to sketch the graph of the function $f$. Mark all vertical, horizontal and oblique asymptotes, as well as all intersections of the graph with the asymptotes and the axis, if any.

*Space for your solution:*

**Problem 3.** In this problem, we will consider functions $(\log_7 x) - 1$ and $\log_7(x+1)$.

**(1).** Solve the equation $(\log_7 x) - 1 = \log_7(x+1)$.

*Space for your solution:*

**(2).** By transforming the graph of $\log_7 x$, sketch the graphs of these functions in the same $(x, y)$-coordinate system. Is this sketch is consistent with your solution of part (1)?

*Space for your solution:*

**Problem 4.** Solve the equation $\cos(t) + \sin(t) = 0$.

*Space for your solution:*