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:

Name: Alexander Kasiukov
Office: Suffolk Federal Credit Union Arena, Room A-109
Phone: (631) 851-6484
Email: kasiuka@sunysuffolk.edu
Web Site: `http://kasiukov.com`

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

Space for your solution:

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

Space for your solution: