Math 233 - Final Exam A

Name _____

May 3, 2024

Score _____

Show all work to receive full credit. Supply explanations where necessary. This portion of the test is due May 9. You must work individually.

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1. (10 points) Let E be the space region inside the cylinder $x^2 + y^2 = 1$ and between the two parallel planes $x + y + z = 1$ and $x + y + z = 3$. Find

$$\iiint_E xy \, dV$$

by setting up and evaluating an iterated integral in cylindrical coordinates. Show all work.

2. (10 points) Let C be the positively-oriented boundary of the plane region enclosed by the graphs of $y = 4x$ and $y = 2x^2$. Use Green's theorem to find

$$\int_C (y^2 - 2xy)\,dx + x^2\,dy.$$

Show all work.

3. (10 points) Find the critical points of f. Then use the 2nd partials test to classify those critical points and determine all relative extrema and saddle points. Show all work.

$$f(x, y) = x^3 + y^2 + 2xy - 4x - 3y + 5$$