Math 126 - Spring 2019
Exam 2
May 21, 2019

Name: ______________________________

Section: ______________________________

Student ID Number: ______________________________

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- There are 4 pages of questions. Make sure your exam contains all these questions.
- You are allowed to use a Ti-30x IIS Calculator model ONLY (**no other calculators allowed**). And you are allowed one **hand-written** 8.5 by 11 inch page of notes (front and back).
- You must show your work on all problems. The correct answer with no supporting work may result in no credit. **Put a box around your FINAL ANSWER for each problem and cross out any work that you don't want to be graded.** Give exact answers wherever possible.
- Leave your answer in exact form. Simplify standard trig, inverse trig, natural logarithm, and root values. For example, don't leave your answer in the form $\sqrt{4}$ or $\cos(\pi/4)$ or $\frac{7}{2} - \frac{3}{5}$ instead write $\sqrt{4} = 2$ and $\cos(\pi/4) = \sqrt{2}/2$ and $\frac{7}{2} - \frac{3}{5} = \frac{29}{10}$.
- There may be multiple versions of the test. Cheating will not be tolerated. We report all suspicions of cheating to the misconduct board. If you are found guilty of cheating by the misconduct board, then you will get a zero on the exam (and likely face other academic penalties). Keep your eyes on your exam!
- You have 50 minutes to complete the exam. Use your time effectively, spend less than 10 minutes on each page and make sure to leave plenty of time to look at every page. Leave nothing blank, show me what you know!

GOOD LUCK!

1. (11 pts) *As always, give answers in simplified exact form.*

   (a) Consider the vector function $\mathbf{r}(t) = \langle\, 6 + t\,,\, 2\tan^{-1}(t)\,,\, 3t + e^{t^2}\, \rangle$.
   Find the tangential component of acceleration at $t = 0$.

   (b) Use implicit differentiation to find $\dfrac{\partial z}{\partial y}$ for

   $$xe^{2z} + x = \ln(x) + 2y^2 z + e$$

   at $(x, y, z) = (1, 1, 1/2)$.

2. (14 pts) **The two parts below are not related.**

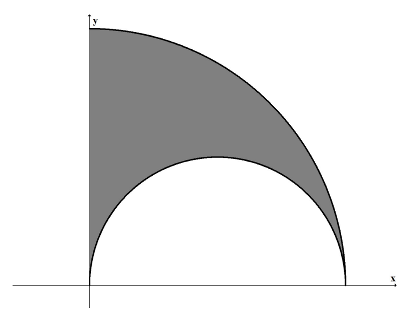
(a) Find and classify all critical points of $f(x,y) = 3xy - \frac{1}{2}y^2 + 2x^3 + \frac{9}{2}x^2$.
Clearly show your work and reasoning in using the 2nd derivative test.

(b) Set up and evaluate $\displaystyle\iint_D e^{y^3}\,dA$ where D is the region bounded by $y = \sqrt{x}$, $y = 2$ and $x = 0$.

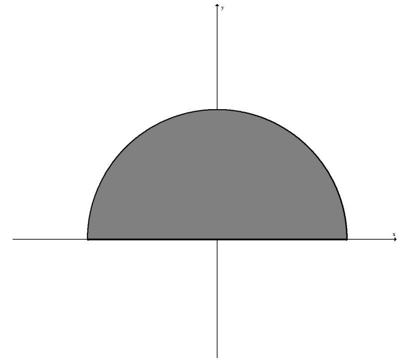
3. (14 pts) **The two parts below are not related.**

(a) Find the volume of the solid in the *first octant* bounded by the parabolic cylinder $z = 12 - 3x^2$ and the plane $y = 3$.

(b) Set up and evaluate $\iint_D 3\sqrt{x^2 + y^2}\, dA$ where D is the region in the first quadrant that lies between the circles $x^2 + y^2 = 1$ and $x^2 + y^2 = x$.



4. (11 pts) Find the global maximum of $f(x, y) = xy^2 - x + 5$ over the region $y \geq 0$ and $x^2 + y^2 \leq 4$. There are two points where the global max occurs, also give these two points (show ALL your work including finding critical points inside the region and analyzing each boundary).



Global Max: $z =$ ____________

Global Max occurs at: $(x, y) =$ ____________ and ____________