EXAM II
**MA 125 6C, CALCULUS I**
October 18, 2017

Name (Print last name first): ..........................................

**Show all your work, simplify and justify your answer!**

**No partial credit will be given for the answer only!**

**PART I**

**You must simplify your answer when possible.**
**All problems in Part I are 10 points each.**

1. Find the derivative of the function $f(x) = (x^3 + 1)^5$.

2. Find the derivative of the function $f(x) = x\sin(x^2)$

3. Find all critical numbers of the function $y = f(x) = (2x+1)^6(x-1)^5$.

4. Find the Absolute Max and Min of the function $f(x) = 2x^3 + 3x^2 - 12x$ on the interval $[-1, 3]$.

5. Verify that the conditions of the Mean Value Theorem hold. Next find the number $c$ which satisfies the conclusion of the Mean Value Theorem for the function $f(x) = x^3$ on the interval $[1, 2]$.

6. Show that the equation $f(x) = \sin(x) + 6x + 1 = 0$ has exactly one solution.

7. Find the linearization of the function $y = f(x) = x^2 \sin(x)$ at $a = \pi/4$ and use it to approximate the value $f(0.78)$. **DO NOT SIMPLIFY THE LINEARIZATION NOR THE VALUE OF $f(.78)$.**

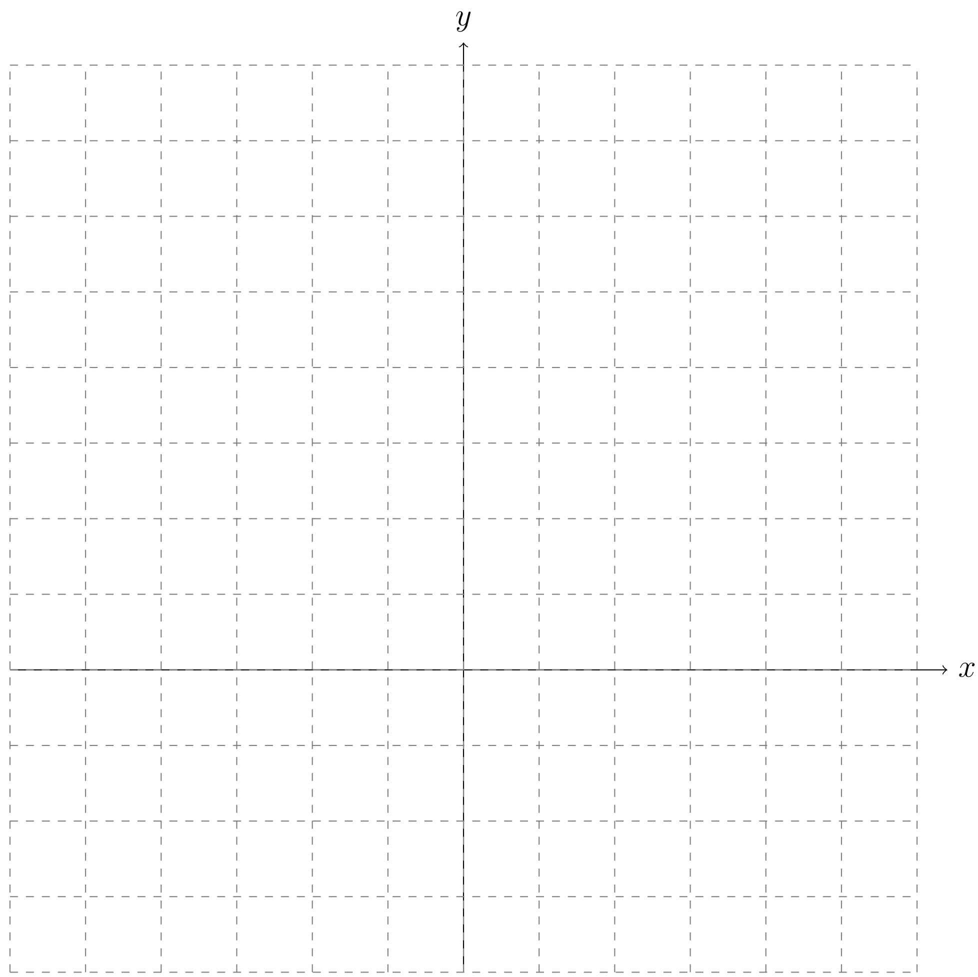
**PART II**

8. [**10 points**] Find the dimensions of an open box (i.e. without a top) of volume $V = 1m^3$ with a square base and minimal surface area.

9. [**20 points**] **Use calculus** to graph the function $f(x) = \dfrac{x^2}{1-x^3}$.

You must show your work on the next page to justify your graph and conclusions. You can use decimal numbers to plot points (but mark them with exact values).

**Draw the graph below but do your work on the next page**



In problem 9, indicate

- $x$ and $y$ intercepts,
- vertical and horizontal asymptotes (if any),
- in/de-creasing; local/absolute max/min (if any),