

Math 10A
Practice Final; Monday, 8/6/2018
Time: 2:10 PM
Instructor: Roy Zhao

Name: _____
Student ID: _____

- **DO NOT OPEN THE PRACTICE FINAL UNTIL TOLD TO DO SO!**
- Do all problems as best as you can. The exam is 60 minutes long. You may not leave during the last 30 minutes of the exam.
- Use the provided sheets to write your solutions. You may use the back of each page for the remainder of your solutions; in such a case, put an arrow at the bottom of the page and indicate that the solution continues on the back page. **No extra sheets of paper can be submitted with this exam!**
- The exam is closed notes and book, which means: **no class notes, no review notes, no textbooks, and not other materials can be used during the exam.** You can only use your cheat sheet. The cheat sheet is one side of one regular 8×11 sheet, handwritten.
- **NO CALCULATORS ARE ALLOWED DURING THE EXAM!**
- Justify all your answers, include all intermediate steps and calculations, and box your answers.

1. (20 points) Find the following derivatives and integrals.

(a) (5 points) $\frac{d}{dx}(\cos(\cos(x)))$.

(b) (5 points) $\frac{d}{dx} \int_{\sqrt{x}}^{x^2} e^{x^2} dx$.

(c) (5 points) $\int x \cos(x) dx$

(d) (5 points) $\int_{-1}^0 2x\sqrt{x+1} dx$.

2. (20 points) Sand is being dumped in a conical pile whose width and height always remain the same. If sand is being dumped in at a rate of $\pi \text{ cm}^3/\text{s}$, how fast is the height of the sand changing when the pile is 4 cm tall? (Hint: The volume of a cone with radius r and height h is $V = \frac{\pi r^2 h}{3}$).

3. (20 points) Let $A = \begin{pmatrix} 1 & 2 & 0 \\ 3 & 7 & 1 \\ 0 & 3 & 1 \end{pmatrix}$.

(a) (5 points) What is the determinant of A ?

(b) (15 points) Use Gaussian elimination to find the solution to $A\vec{x} = \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}$.

4. (20 points) Find the general solution of the following differential equations.

(a) (10 points) $y'' - 2y' + 5y = 0$.

(b) (10 points) $y' + 3\frac{y}{x} - \frac{e^x}{x^3} = 0$.

5. (20 points) (a) (15 points) Find the line of best fit through the set of points $\{(1, 1), (2, 0), (3, 5)\}$.

(b) (5 points) Calculate the least square error of using your line of best fit from above.