Name _____   Student ID_____

Section time & instructor _____

Math 1A—Calculus, Spring 2017—Haiman
Midterm Exam 2

Instructions:

- Wait until time to start is announced before looking at the exam questions.

- Write your name, ID number and section time and instructor's name on this page now. Before turning in your exam, write your name and ID number where indicated on the first side of the second page.

- Write your answers on the exam paper in the space provided. Do preliminary work on scratch paper, then write a clear and concise answer giving your solution and enough steps to justify it.

  Even if you have a correct answer, points may be deducted if parts of what you write are incorrect or irrelevant.

  If you need more space for an answer, attach an extra page, and write your name and ID number on it. Ordinarily, extra pages should not be needed.

- You may use one sheet (written on both sides) of prepared notes. No other notes, books, calculators, or other electronic devices are allowed.

- There are 6 questions, for a total of 100 points.

1. (16 pts) Evaluate the limit:

$$\lim_{x \to \infty} \frac{\sqrt{3x^6 - 2x^3 + 5}}{7 - x^3}$$

2. (16 pts) Find the derivative of $\sin(x + \sin \pi x)$.

3. (16 pts) Find the derivative of $x^{(x^2)}$.

4. (18 pts) Find an equation of the tangent line to the curve

$$xy + \ln(\frac{x+y}{3}) = 2$$

at the point $(2, 1)$.

5. (18 pts) An airplane in level flight at an altitude of $3000\,m$ is approaching a radar station on the ground straight ahead. The radar station detects that the distance to the plane is $5000\,m$, and that this distance is decreasing at a rate of $200\,m/s$. At what speed is the plane flying?

The radar measures distance in a straight line from its antenna on the ground to the plane in the air.

6. (16 pts) Use a linear approximation or differentials to estimate the value of $\sqrt[3]{10}$, based on the known exact value $\sqrt[3]{8} = 2$.