Circle your TA discussion section.

- AD1 – 9:00 Mary Angelica
- ADB – 9:00 Adriana
- ADE – 12:00 Hsin-Po
- ADH – 3:00 Ravi
- ADL – 11:00 Dara
- ADO – 2:00 Chaeryn
- ADA – 8:00 Maria
- ADC – 10:00 Xunjun (Henry)
- ADJ – 9:00 Ciaran
- ADM – 12:00 Dara
- ADQ – 4:00 Chaeryn
- ADD – 11:00 Artur
- ADK – 10:00 Ciaran
- ADF – 1:00 Artur
- ADG – 2:00 Maria
- ADN – 1:00 Hsin-Po
- ADR – 10:00 Adriana

- Sit in your assigned seat (circled below).
- Do not open this test booklet until I say START.
- Turn off all electronic devices and put away all items except a pen/pencil and an eraser.
- There is no partial credit on multiple-choice questions. For all other questions, you must show sufficient work to justify your answer.
- While the test is in progress, we will not answer questions concerning the test material.
- Do not leave early unless you are at the end of a row.
- Quit working and close this test booklet when I say STOP.
- Quickly turn in your test to me or a TA and show your Student ID.
1. (10 points) Find $g'(q)$ given that $g(q) = \left( \frac{ln(q^7)}{arctan(2q)} \right)^9$

2. (10 points) Find $s'(x)$ given that $s(x) = (32 - x)^{1/x^2}$
3. (10 points) Find $h'(s)$ given that $h(s) = \cos^4(2s)e^{s^2-3s}$

4. (10 points) Find $\frac{dy}{dx}$ given that $\frac{x^5}{\sin(y)} = 7x^5 - 4y^2$
5. (10 points) Solve the following differential equations given that the graph of each solution goes through the point \((\theta, h) = (0, 5)\). You must use the given variables.

(a) \[ \frac{dh}{d\theta} = 16\theta \]

(b) \[ \frac{dh}{d\theta} = 16h \]

6. (10 points) Evaluate the limit. You must fully justify your answer.

\[ \lim_{x \to 0} \frac{\sin(7x) - 7e^x + 7}{e^{6x} - 6x - 1} \]
7. (10 points) Let \( f(x) = \frac{4x}{\ln(x)} \). Determine each interval where \( f \) is increasing and each interval where \( f \) is decreasing.
8. (10 points) A function $f(x)$ is continuous at each real number and it has the following first derivative (below). Find each interval where $f(x)$ is concave up, each interval where $f(x)$ is concave down, and list the $x$-coordinate of each inflection point.

$$f'(x) = 3x^4 - 32x^3 + 96x^2$$
9. (10 points) Find the x-coordinate of the point on the graph of \( y = 2x + 2 \) which is closest to the point (3,0).
10. (10 points) A 12 foot ladder rests against a wall, making an angle $\theta$ between the ladder and the ground. The ladder begins to slide down the wall. When the bottom of the ladder is 4 feet from the wall, the angle $\theta$ is decreasing at a rate of 0.5 rads/sec. How fast is the ladder sliding down the wall at this time?
Students – do not write on this page!

1. (10 points) ____________________

2. (10 points) ____________________

3. (10 points) ____________________

4. (10 points) ____________________

5. (10 points) ____________________

6. (10 points) ____________________

7a. (10 points) ____________________

8. (10 points) ____________________

9. (10 points) ____________________

10. (10 points) ____________________

TOTAL (100 points) ______________