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
- AD2 – 1:00 Stefan
- ADC – 10:00 Xunjun (Henry)
- ADF – 1:00 Artur
- ADJ – 9:00 Ciaran
- ADD – 11:00 Artur
- ADG – 2:00 Maria
- ADB – 8:00 Maria
- ADH – 3:00 Ravi
- ADD – 11:00 Artur
- ADK – 10:00 Ciaran
- 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.
- Remove hats and sunglasses.
- 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. (20 points) Circle True if the statement is always true. Otherwise circle false.

(a) (5 points) If \( \lim_{x \to a} f(x) \) exists, then \( f(x) \) is continuous at \( x = a \).

true or false?

(b) (5 points) The function \( f(x) = \frac{4 - x}{x^2 - 7x + 12} \) has a vertical asymptote at \( x = 4 \).

true or false?

(c) (5 points) Let \( f(x) \) be a continuous function on the closed interval \([1,10]\). If \( f(2) = -5 \) and \( f(5) = 5 \), then it must be true that there is some number \( c, 2 < c < 5 \), such that \( f(c) = 3 \).

true or false?

(d) (5 points) If \( v(t) \) is an odd function, and \( w(t) \) is an odd function, then \( p(t) = (v(w(t)))^2 \) is an odd function.

true or false?
2. (10 points) Find the equation of each horizontal asymptote for the following graph. Your answer
must be justified using limits.

\[ f(x) = \frac{7 + 8x^3}{x^3 - 4} \]

3. (10 points) Determine a formula for an exponential function, given that its graph goes through the
points \((0, e^6)\) and \((4, e^{20})\).
4. (10 points) Let \( f(x) = 2x^2 - 3x \).

Use the definition of a derivative as a limit to prove that \( f'(x) = 4x - 3 \).

Show each step in your calculation and be sure to use proper terminology in each step of your proof.
5. (10 points) The function \( q(t) = \frac{\ln(7)}{4e^{6t}} \) is one-to-one on its domain. Determine a formula for its inverse \( q^{-1}(t) \).

6. (12 points) Determine the domain of the following function.

\[
g(x) = \frac{\ln(2 - 3x) + \sin(3e^{4x})}{1 - e^{5x}}
\]
7. (6 points each) Evaluate the following limits without the use of derivatives. Show sufficient justification for each answer. An answer of ‘does not exist’ is not sufficient. For infinite limits you must state if it is \( \infty \) or \(-\infty\).

(a) \[ \lim_{x \to 8} \frac{16 - 2x}{4 - \sqrt{2x}} \]

(b) \[ \lim_{x \to 3^-} \frac{x - 4}{\ln(4 - x)} \]
(c) \( \lim_{x \to \infty} \frac{\sin(x^2 \cos(x))}{e^x} \)

(d) \( \lim_{x \to \pi/4} \frac{\cos(2x)}{\cos(x) - \sin(x)} \)

(e) \( \lim_{x \to 1^+} \frac{e^{2x}}{\sin \left( \frac{x-1}{x-2} \right)} \)
1. (20 points) _______________________
2. (10 points) _______________________
3. (10 points) _______________________
4. (10 points) _______________________
5. (10 points) _______________________
6. (12 points) _______________________
7a. (6 points) _______________________
7b. (6 points) _______________________
7c. (6 points) _______________________
7d. (6 points) _______________________
7d. (6 points) _______________________

TOTAL (100 points) ________________