Name _____ **UIN** _____

(circle your TA discussion section)

▷ **AD1**, TR 11:00-11:50, Amita Malik	▷ **AD2**, TR 1:00-1:50, Amita Malik
▷ **AD3**, TR 1:00-1:50, Neha Gupta	▷ **AD4**, TR 1:00-1:50, Meghan Galiardi
▷ **AD5**, TR 2:00-2:50, Neha Gupta	▷ **AD7**, TR 3:00-3:50, Meghan Galiardi
▷ **AD8**, TR 1:00-2:50, Hannah Kolb-Spinoza	▷ **AD9**, TR 9:00-10:50, Vicki Reuter
▷ **BD1**, TR 2:00-2:50, Stephen Longfield	▷ **BD2**, TR 8:00-8:50, Eliana Duarte
▷ **BD3**, TR 11:00-11:50, Michael Santana	▷ **BD4**, TR 9:00-9:50, Eliana Duarte
▷ **BD5**, TR 2:00-2:50, Stephen Berning	▷ **BD6**, TR 1:00-1:50, Faruk Temur
▷ **BD7**, TR 3:00-3:50, Stephen Berning	▷ **BD8**, TR 3:00-3:50, Stephen Longfield

- Sit in your assigned seat (circled below).

- Circle your TA discussion section.

- 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.

- You must show sufficient work to justify each 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.

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1. (4 points each) Circle **true** if the given statement is always true. Otherwise circle **false**.

   (a) A function which is differentiable at a point a must also be continuous at a.

   true or **false** ?

   (b) If a function $f(x)$ is not defined at $x = c$, then $\lim_{x \to c} f(x)$ does not exist.

   true or **false** ?

   (c) If $f(x)$ is an even function, then $g(x) = (f(2x - 4))^2$ is also an even function.

   true or **false** ?

   (d) For each function $f(x)$, if $f(a)$ is negative and $f(b)$ is positive, then there is a number c in the interval (a, b) such that $f(c) = 0$.

   true or **false** ?

2. (4 points) Suppose $f(x)$ is an odd function for which $\lim_{x \to 2^+} f(x) = -\infty$. Which one of the following limits must be true?

   (a) $\lim_{x \to 2^+} f(x) = \infty$

   (b) $\lim_{x \to 2^-} f(x) = -\infty$

   (c) $\lim_{x \to 2^-} f(x) = \infty$

   (d) $\lim_{x \to -2^-} f(x) = -\infty$

   (e) $\lim_{x \to -2^-} f(x) = \infty$

   (f) $\lim_{x \to -2^+} f(x) = -\infty$

   (g) $\lim_{x \to -2^+} f(x) = \infty$

3. (10 points) Let $f(x) = 5x^2 + 4x$.

   Use the definition of a derivative as a limit to prove that $f'(x) = 10x + 4$.

   Show each step in your calculation and be sure to use proper terminology in each step of your proof.

4. (10 points) Determine a formula for $f^{-1}(x)$ given that $f(x) = \dfrac{2x+3}{4x-5}$

5. (5 points each) Evaluate the following quantities and simplify your answer.

(a) $\csc\left(\dfrac{5\pi}{6}\right)$

(b) $\tan^{-1}(-1)$

(c) $\dfrac{e^{2\ln(6)}}{\ln(e^3)}$

6. (10 points) Find the domain of the function $f(x) = \dfrac{\sqrt{x}}{\ln(6-0.5x)}$

7. (10 points) The graph of an exponential function goes through points $(0, 3)$ and $(2, 12)$. What is the x-value for the point of intersection of the exponential function and the horizontal line $y = 300$?

8. (5 points) Write the equation for the horizontal asymptote on the graph of $f(x) = \sin^{-1}\left(1 - \dfrac{4}{x^2}\right)$.

9. (5 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 ∞ or $-\infty$.

(a) $\lim\limits_{x \to \infty} \dfrac{15 + 2x}{3x + 4}$

(b) $\lim\limits_{x \to 0} \dfrac{5e^x + 3}{2e^x + 7}$

(c) $\displaystyle\lim_{x\to\pi/4} \frac{1-\tan x}{\sin x - \cos x}$

(d) $\displaystyle\lim_{x\to4} \frac{\sqrt{2x+1}-3}{x-4}$

Students – do not write on this page!

1. (16 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

2. (4 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

3. (10 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

4. (10 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

5. (15 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

6. (10 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

7. (10 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

8. (5 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

9a. (5 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

9b. (5 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

9c. (5 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

9d. (5 points) ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

TOTAL (100 points) ⎯⎯⎯⎯⎯⎯⎯⎯