MATH 220 **Test 1** **Spring 2015**

Name _____ **NetID** _____

- 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.

▷ **AD1**, TR 9:00-10:50, Andrew McConvey
▷ **AD2**, TR 1:00-2:50, Derrek Yager
▷ **ADA**, TR 8:00-8:50, Mi Young Jang
▷ **ADB**, TR 9:00-9:50, Stephen Berning
▷ **ADC**, TR 10:00-10:50, Sarah Yeakel
▷ **ADD**, TR 11:00-11:50, Michael Livesay
▷ **ADE**, TR 12:00-12:50, George Shakan
▷ **ADF**, TR 1:00-1:50, Albert Tamazyan
▷ **ADG**, TR 2:00-2:50, Alonza Terry
▷ **ADH**, TR 3:00-3:50, Alonza Terry
▷ **ADJ**, TR 9:00-9:50, Mi Young Jang
▷ **ADK**, TR 10:00-10:50, Stephen Berning
▷ **ADL**, TR 11:00-11:50, Adam Wagner
▷ **ADM**, TR 12:00-12:50, Adam Wagner
▷ **ADN**, TR 1:00-1:50, Mychael Sanchez
▷ **ADO**, TR 2:00-2:50, Mychael Sanchez
▷ **ADP**, TR 3:00-3:50, Albert Tamazyan
▷ **ADQ**, TR 4:00-4:50, George Shakan
▷ **ADR**, TR 9:00-9:50, Michael Livesay

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FRONT OF ROOM – 314 Altgeld Hall

1. (12 points) Let $f(x) = x^3 - 42x$.

   Use the definition of a derivative as a limit to prove that $f'(x) = 3x^2 - 42$.

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

2. (12 points) The function $f(x) = 20e^{5x} + 15x - 12$ has derivative $f'(x) = 100e^{5x} + 15$. Determine a formula for the line which is tangent to the graph of $f(x)$ at its y-intercept.

3. (12 points) Let $R(t)$ be the number of rabbits living on Lady Tottington's estate t months after they were initially discovered. This rabbit population grows exponentially. Given that $R(2) = 10$ and $R(5) = 90$, determine a formula for $R(t)$.

4. (12 points) Determine a formula for $g^{-1}(x)$ given that $g(x) = \dfrac{8x^9 - 3}{5x^9 + 4}$

5. (12 points) Solve the following equation for x and simplify your answer.

$\ln(2) + 9\ln(-x) = \ln(-128x^7)$

6. (10 points) Suppose that $w(x)$ is odd, one-to-one, and its graph goes through the point $(4, -1/3)$.

   (a) Determine another point which must be on the graph of $w(x)$.

   (b) Determine a point which must be on the graph of $w^{-1}(x)$.

7. (5 points) Given that $\cos(\pi/5) = \dfrac{1+\sqrt{5}}{4}$, evaluate $\cos(4\pi/5)$.

8. (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) $\displaystyle\lim_{x\to-\infty} \frac{(2x+1)^5}{4+3x^5}$

(b) $\lim_{x \to \infty} \dfrac{\cos(2x)}{x^{10}}$

(c) $\lim_{x \to -\infty} \dfrac{16 \arctan(5x) + 14\pi}{4 \arctan(9x) + 5\pi}$

(d) $\lim_{x \to \ln 9} \dfrac{e^x - 9}{e^{2x} - 81}$

(e) $\lim_{x \to 8^+} \dfrac{\ln\left(1/x^2\right)}{1 - e^{(x^2-64)}}$

Students – do not write on this page!

1. (12 points) _____

2. (12 points) _____

3. (12 points) _____

4. (12 points) _____

5. (12 points) _____

6. (10 points) _____

7. (5 points) _____

8a. (5 points) _____

8b. (5 points) _____

8c. (5 points) _____

8d. (5 points) _____

8e. (5 points) _____

TOTAL (100 points) _____