MATH 220 **Test 1** **Spring 2013**

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, Nick Andersen	▷ **ADH**, TR 3:00-3:50, Nathan Rehfuss
▷ **AD2**, TR 1:00-2:50, Sarah Loeb	▷ **ADJ**, TR 9:00-9:50, Dan Schultz
▷ **ADA**, TR 8:00-8:50, Lisa Hickok	▷ **ADK**, TR 10:00-10:50, Dan Schultz
▷ **ADB**, TR 9:00-9:50, Sneha Chaubey	▷ **ADL**, TR 11:00-11:50, Derrek Yager
▷ **ADC**, TR 10:00-10:50, Sneha Chaubey	▷ **ADM**, TR 12:00-12:50, Derrek Yager
▷ **ADD**, TR 11:00-11:50, Tom Mahoney	▷ **ADN**, TR 1:00-1:50, Ben Fulan
▷ **ADE**, TR 12:00-12:50, Tom Mahoney	▷ **ADO**, TR 2:00-2:50, Ben Fulan
▷ **ADF**, TR 1:00-1:50, Lisa Hickok	▷ **ADP**, TR 3:00-3:50, Mahmood Etedadi Aliabadi
▷ **ADG**, TR 2:00-2:50, Nathan Rehfuss	▷ **ADQ**, TR 4:00-4:50, Mahmood Etedadi Aliabadi

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FRONT OF ROOM – 314 Altgeld Hall

1. (6 points) Circle the domain of the function $f(x) = \dfrac{\sqrt{9-x^2} + \ln(x+1) + e^{x-2}}{\sqrt[3]{x-4}}$

   (a) $(-3, -1]$

   (b) $(-3, 2]$

   (c) $(-3, 3]$

   (d) $(-3, 4]$

   (e) $(-1, 2]$

   (f) $(-1, 3]$

   (g) $(-1, 4]$

   (h) $(2, 3]$

   (i) $(2, 4]$

   (j) $(3, 4]$

   (k) $(-\infty, \infty)$

2. (6 points) For the function g, the following finite limit exists.

$$\lim_{\alpha \to 0} \frac{g(b+\alpha) - g(b)}{\alpha}$$

   From the choices below, circle the three statements which must be true.

   (a) g is one-to-one.

   (b) g is an odd function.

   (c) g is an even function.

   (d) g is differentiable at 0.

   (e) g is differentiable at b.

   (f) g is differentiable at α.

   (g) g is continuous at 0.

   (h) g is continuous at b.

   (i) g is continuous at α.

   (j) $\lim_{x \to 0} g(x) = g(0)$

   (k) $\lim_{x \to b} g(x) = g(b)$

   (l) $\lim_{x \to \alpha} g(x) = g(\alpha)$

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

   (a) $\tan\left(\arcsin(4/5)\right)$

   (b) $e^{2\ln(5)} + 6\ln\left(\sqrt{e}\right)$

5. (10 points) The function $f(x) = 12 - 3x^2$ with restricted domain $x \leq 0$ is one-to-one. Determine a formula for its inverse $f^{-1}(x)$.

6. (12 points) Find a formula for an exponential function $f(x)$ for which $f(0) = 3$ and $f(2) = 12$. For which real number b does $f(b) = 500$?

7. (8 points) For a given acute angle θ, it is known that $\cos\theta = 4/5$. Determine the value of $\cos(\pi - 2\theta)$. Write your answer as a simplified fraction.

8. (7 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) $\lim_{x\to\infty} \dfrac{\sin x}{x}$

(b) $\lim_{x\to\pi^+} \dfrac{\cos(\pi - x)}{\pi - x}$

(c) $\lim_{x\to-\infty} \dfrac{2x^3 + 1}{5x + 3x^3}$

(d) $\lim_{x \to 5} \left(\dfrac{10}{x^2 - 25} - \dfrac{1}{x - 5} \right)$

9. (8 points) Does the function $f(x) = \dfrac{1 - e^x}{1 - e^{2x}}$ have a vertical asymptote at $x = 0$? Explain your reasoning.

Students – do not write on this page!

1. (6 points) _____

2. (6 points) _____

3. (10 points) _____

4. (12 points) _____

5. (10 points) _____

6. (12 points) _____

7. (8 points) _____

8a. (7 points) _____

8b. (7 points) _____

8c. (7 points) _____

8d. (7 points) _____

9. (8 points) _____

TOTAL (100 points) _____