MATH 220 **Test 1** **Spring 2016**

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, Hannah Burson	▷ **ADH**, TR 3:00-3:50, Dara Zirlin
▷ **AD2**, TR 1:00-2:50, Cassie Christenson	▷ **ADJ**, TR 9:00-9:50, Xujun 'Henry' Liu
▷ **ADA**, TR 8:00-8:50, Iftikhar Ahmed	▷ **ADK**, TR 10:00-10:50, Xujun 'Henry' Liu
▷ **ADB**, TR 9:00-9:50, Iftikhar Ahmed	▷ **ADL**, TR 11:00-11:50, Jooyeon 'Jane' Chung
▷ **ADC**, TR 10:00-10:50, Elizabeth 'Liz' Tatum	▷ **ADM**, TR 12:00-12:50, Jooyeon 'Jane' Chung
▷ **ADD**, TR 11:00-11:50, Elizabeth 'Liz' Tatum	▷ **ADN**, TR 1:00-1:50, Xiaolong 'Hans' Han
▷ **ADE**, TR 12:00-12:50, Emily Heath	▷ **ADO**, TR 2:00-2:50, Martino Fassina
▷ **ADF**, TR 1:00-1:50, Emily Heath	▷ **ADP**, TR 3:00-3:50, Martino Fassina
▷ **ADG**, TR 2:00-2:50, Dara Zirlin	▷ **ADQ**, TR 4:00-4:50, Xiaolong 'Hans' Han

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1  2  3  4  5  6 ‖ 7     8 ‖ 9  10 11 12 13 14 15 16 17 18 19 20 21 ‖ 22    23 ‖
1  2  3  4  5  6 ‖ K        ‖                                         ‖       K  ‖    1  2  3
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1  2  3  4  5  6 ‖ C     C ‖ 1  2  3  4  5  6  7  8  9  10 11 12 13 ‖ C     C ‖ 1  2  3  4  5  6
1  2  3  4  5  6 ‖ B     B ‖ 1  2  3  4  5  6  7  8  9  10 11 12 13 ‖ B     B ‖ 1  2  3  4  5  6
                   ‖       A ‖ 1  2  3                      1  2  3 ‖ A
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FRONT OF ROOM – 100 Materials Science and Engineering Building

1. (5 points) If $\sin(\theta) = 1/3$, which one of the following values is equal to $35\csc(\theta) + 15\cot^2(\theta)$?

(a) 225   (b) 230   (c) 235   (d) 240   (e) 245   (f) 250

(g) 255   (h) 260   (i) 265   (j) 270   (k) 275   (l) 280

2. (5 points) Which one of the following values is equal to $3e^{4\ln(2)} + \ln\left(42e^5\right) - \ln\left(42e^{21}\right)$?

(a) 14   (b) 16   (c) 18   (d) 20   (e) 22   (f) 24

(g) 26   (h) 28   (i) 30   (j) 32   (k) 34   (l) 36

3. (5 points) Suppose $f(x)$ is an odd function for which $\lim\limits_{x\to-5^-} f(x) = \infty$. Which one of the following limits must be correct?

(a) $\lim\limits_{x\to-5^+} f(x) = -\infty$

(b) $\lim\limits_{x\to-5^+} f(x) = \infty$

(c) $\lim\limits_{x\to-5^+} f(x) = 0$

(d) $\lim\limits_{x\to5^+} f(x) = -\infty$

(e) $\lim\limits_{x\to5^+} f(x) = \infty$

(f) $\lim\limits_{x\to5^+} f(x) = 0$

(g) $\lim\limits_{x\to5^-} f(x) = -\infty$

(h) $\lim\limits_{x\to5^-} f(x) = \infty$

(i) $\lim\limits_{x\to5^-} f(x) = 0$

4. (5 points) Which one of the following functions has a vertical asymptote?

(a) $g(x) = \sin x$

(b) $g(x) = e^{-x}$

(c) $g(x) = \arctan x$

(d) $g(x) = \dfrac{x^2}{x^2 + 169}$

(e) $g(x) = \dfrac{x + 13}{x^2 + 169}$

(f) $g(x) = \dfrac{x + 169}{x^2 + 169}$
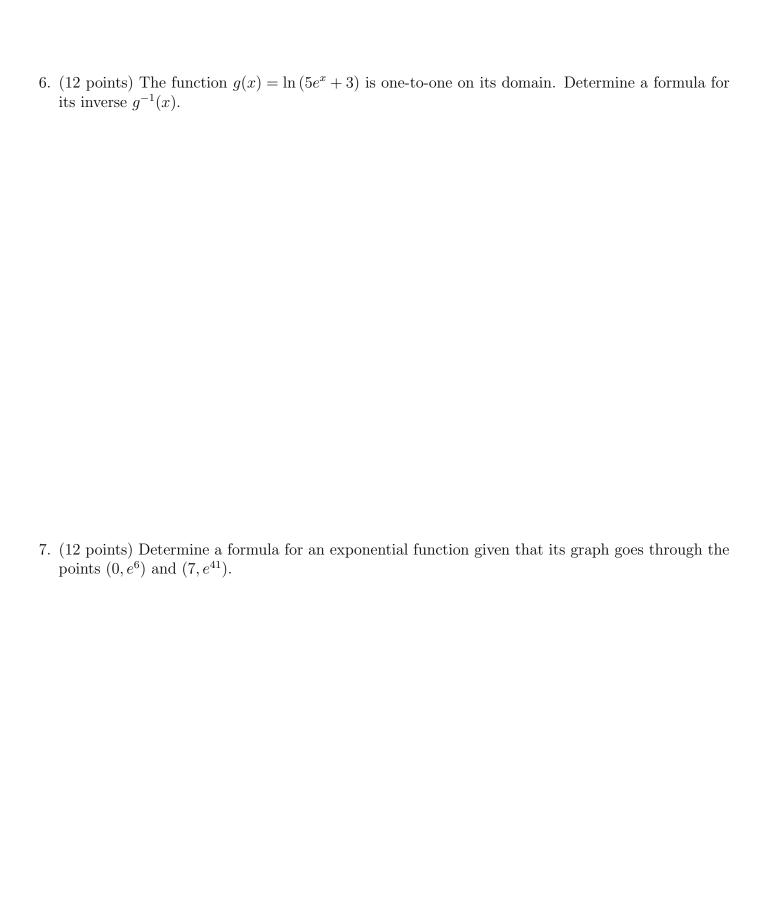
(g) $g(x) = \dfrac{x^2 + 13x}{x + 13}$

(h) $g(x) = \dfrac{x^2 - 13x}{x + 13}$

(i) $g(x) = \dfrac{x^2 - 13x}{x - 13}$

5. (12 points) Let $f(x) = 12x^2 - 4$.

Use the definition of a derivative as a limit to prove that $f'(x) = 24x$.

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

6. (12 points) The function $g(x) = \ln(5e^x + 3)$ is one-to-one on its domain. Determine a formula for its inverse $g^{-1}(x)$.

7. (12 points) Determine a formula for an exponential function given that its graph goes through the points $(0, e^6)$ and $(7, e^{41})$.

8. (12 points) Determine the domain of the given function. Use interval notation.

$$f(x) = \frac{x^2 - 16}{\ln\left(22 - 7\ln x\right)}$$

9. (8 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) $\displaystyle\lim_{x \to \infty} \frac{\sin\left(x^2 + 2e^{4x} + 5\arctan\left(x\right)\right)}{x^8}$

(b) $\lim\limits_{x \to \infty} \dfrac{65 - 91e^x}{13e^x + 3}$

(c) $\lim\limits_{x \to 5} \dfrac{x - 5}{\sqrt{42x + 46} - 16}$

(d) $\lim\limits_{x \to \infty} \dfrac{\ln\left(e^{22} + e^{-x}\right)}{\ln\left(1 - e^{-x}\right)}$

Students – do not write on this page!

1. (5 points) —————————————————

2. (5 points) —————————————————

3. (5 points) —————————————————

4. (5 points) —————————————————

5. (12 points) —————————————————

6. (12 points) —————————————————

7. (12 points) —————————————————

8. (12 points) —————————————————

9a. (8 points) —————————————————

9b. (8 points) —————————————————

9c. (8 points) —————————————————

9d. (8 points) —————————————————

TOTAL (100 points) ————————————