MATH 220 **Test 1** **Spring 2017**

Name _____ **NetID** _____

UIN _____

Circle your TA discussion section.

- ▷ **AD1**, TR 9:00-10:50, Andrew McConvey
- ▷ **AD2**, TR 1:00-2:50, Sarah Loeb
- ▷ **ADA**, TR 8:00-8:50, Christopher Linden
- ▷ **ADB**, TR 9:00-9:50, Dakota Ihli
- ▷ **ADC**, TR 10:00-10:50, Cassie Christenson
- ▷ **ADD**, TR 11:00-11:50, Daulet Dyussekenov
- ▷ **ADE**, TR 12:00-12:50, Daulet Dyussekenov
- ▷ **ADF**, TR 1:00-1:50, Cassie Christenson
- ▷ **ADG**, TR 2:00-2:50, Xinghua Gao
- ▷ **ADH**, TR 3:00-3:50, Xinghua Gao
- ▷ **ADJ**, TR 9:00-9:50, Lan Wang
- ▷ **ADK**, TR 10:00-10:50, Lan Wang
- ▷ **ADO**, TR 2:00-2:50, Christopher Linden
- ▷ **ADQ**, TR 4:00-4:50, Dakota Ihli

- 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.

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FRONT OF ROOM – 314 Altgeld Hall

1. (12 points) The function $w(x) = \dfrac{13x^5 + 2}{3x^5 + 11}$ is one-to-one on its domain. Determine a formula for its inverse $w^{-1}(x)$.

2. (12 points) Determine the domain of the following function.

$$g(x) = \left(x^2 - 196\right) e^{x-68} + \ln\left(10 - x\right) - \sqrt{3x^2 - 363}$$

3. (12 points) The function $f(x) = 20e^{5x} - 60$ has derivative $f'(x) = 100e^{5x}$. Determine a formula for the line which is tangent to the graph of $f(x)$ at its x-intercept.

4. (10 points) Determine an equation for each vertical asymptote on the graph of the following function. Your answer must be justified using limits.

$$f(x) = \frac{7x - 91}{x^2 - 169}$$

5. (10 points) Let $f(x) = 8x - 15x^2$.

   Use the definition of a derivative as a limit to prove that $f'(x) = 8 - 30x$.

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

6. (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) $\lim_{x\to\infty} \dfrac{3-56e^{9x}}{8e^{9x}+2}$

(b) $\lim_{x\to\pi} \dfrac{\sin^2(x)}{1+\cos(x)}$

(c) $\lim_{x \to \infty} \dfrac{5 \arctan\left(x^2 \sin\left(x\right)\right)}{e^{6x}}$

7. (5 points) If the point $(4, -2)$ is on the graph of a one-to-one function $f(x)$, then which one of the following points must be on the graph of $f^{-1}(x)$?

(a) $(-4, -2)$ (b) $(2, 4)$ (c) $(2, -4)$ (d) $(-2, 4)$ (e) $(-2, -4)$

(f) $(1, 1)$ (g) $(4, 1/2)$ (h) $(1/4, 1/2)$ (i) $(4, 2)$ (j) $(-4, 2)$

8. (5 points) If the point $(8, -7)$ is on the graph of an odd function $f(x)$, then which one of the following points must also be on the graph of $f(x)$?

(a) $(8, 7)$ (b) $(-8, 7)$ (c) $(-8, -7)$ (d) $(7, 8)$ (e) $(7, -8)$

(f) $(-7, 8)$ (g) $(-7, -8)$ (h) $(1, 1)$ (i) $(8, 1/7)$ (j) $(1/8, 1/7)$

9. (5 points) If $\cos(\theta) = 1/4$, which one of the following values is equal to $16\cos(2\theta) + 5\tan^2(\theta)$?

(a) 6 (b) 11 (c) 16 (d) 21 (e) 26 (f) 31

(g) 36 (h) 41 (i) 46 (j) 51 (k) 56 (l) 61

10. (5 points) Which one of the following values is equal to $e^{-3\ln(2)}\left(10\ln\left(e^3\right) + 20\ln\left(\sqrt{e}\right)\right)$?

(a) 1 (b) 2 (c) 3 (d) 4 (e) 5 (f) 6

(g) 7 (h) 8 (i) 9 (j) 10 (k) 11 (l) 12

Students – do not write on this page!

1. (12 points) _____

2. (12 points) _____

3. (12 points) _____

4. (10 points) _____

5. (10 points) _____

6a. (8 points) _____

6b. (8 points) _____

6c. (8 points) _____

7. (5 points) _____

8. (5 points) _____

9. (5 points) _____

10. (5 points) _____

TOTAL (100 points) _____