MATH 220 **Test 3** **Fall 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 11:00-12:50, Sarah Loeb / Hannah Spinoza
▷ **AD2**, TR 9:00-10:50, M.Tip Phaovibul
▷ **AD3**, TR 1:00-2:50, Cara Monical
▷ **ADA**, TR 8:00-8:50, Nima Rasekh
▷ **ADB**, TR 9:00-9:50, Hong Liu
▷ **ADC**, TR 10:00-10:50, Hong Liu
▷ **ADD**, TR 11:00-11:50, Stephen Berning
▷ **ADE**, TR 12:00-12:50, Stephen Berning
▷ **ADF**, TR 1:00-1:50, Christopher Bailey
▷ **ADG**, TR 2:00-2:50, Christopher Bailey
▷ **ADH**, TR 3:00-3:50, Neriman Tokcan
▷ **ADI**, TR 4:00-4:50, Neriman Tokcan
▷ **ADJ**, TR 9:00-9:50, Nima Rasekh
▷ **ADK**, TR 10:00-10:50, Michael Obiero Oyengo
▷ **ADL**, TR 11:00-11:50, Andrew McConvey
▷ **ADM**, TR 12:00-12:50, Benjamin Wright
▷ **ADN**, TR 1:00-1:50, Benjamin Wright
▷ **ADO**, TR 2:00-2:50, Vanessa Rivera-Quiñones
▷ **ADP**, TR 3:00-3:50, Vanessa Rivera-Quiñones
▷ **ADR**, TR 9:00-9:50, Michael Santana
▷ **ADS**, TR 12:00-12:50, Andrew McConvey
▷ **ADT**, TR 2:00-2:50, Alessandro Gondolo
▷ **ADU**, TR 3:00-3:50, Alessandro Gondolo

263	264	265	266	267	268	269	270	•	271	272	273					278	279	•	280	281	282	283	284	285	286	287
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FRONT OF ROOM – 314 Altgeld Hall

1. (8 points) Suppose that F and F' are each differentiable (and thus continuous) everywhere and that m and n are constants. Circle the choice below which most clearly states part 2 of the Fundamental Theorem of Calculus.

(a) $\int_m^n F'(t)\,dt = F'(m) - F'(n)$

(b) $\int_m^n F(t)\,dt = F'(m) - F'(n)$

(c) $\int_m^n F'(t)\,dt = F(m) - F(n)$

(d) $\int_m^n F(t)\,dt = F(m) - F(n)$

(e) $\int_m^n F'(t)\,dt = F'(n) - F'(m)$

(f) $\int_m^n F(t)\,dt = F'(n) - F'(m)$

(g) $\int_m^n F'(t)\,dt = F(n) - F(m)$

(h) $\int_m^n F(t)\,dt = F(n) - F(m)$

2. (8 points) If Newton's Method is used to approximate a solution to the equation $f(x) = 0$, then it generates a sequence of approximations $x_1, x_2, x_3, x_4, \ldots$. Which one of the following correctly shows how x_n can be used to determine the next approximation x_{n+1} ?

(a) $x_{n+1} = \dfrac{x_n + f'(x_n)}{f(x_n)}$

(b) $x_{n+1} = x_n + \dfrac{f'(x_n)}{f(x_n)}$

(c) $x_{n+1} = \dfrac{x_n + f(x_n)}{f'(x_n)}$

(d) $x_{n+1} = x_n + \dfrac{f(x_n)}{f'(x_n)}$

(e) $x_{n+1} = \dfrac{x_n - f'(x_n)}{f(x_n)}$

(f) $x_{n+1} = x_n - \dfrac{f'(x_n)}{f(x_n)}$

(g) $x_{n+1} = \dfrac{x_n - f(x_n)}{f'(x_n)}$

(h) $x_{n+1} = x_n - \dfrac{f(x_n)}{f'(x_n)}$

3. (8 points) Let $g(x) = \displaystyle\int_4^x e^t(t-13)\,dt$. Determine the x-value for each inflection point of $g(x)$.

4. (8 points) Suppose that $f(x)$ is a polynomial and that the graph of $f(x)$ intersects the line $y = 10$ at $x = 4$, $x = 8$ and $x = 16$. Let n be the number of x-values for which $f'(x) = 0$.

   (a) Fill in the blank: $n \geq$ ____________

   (b) Give a full justification for why your answer in part (a) must be true.

5. (8 points) Fill in the missing information to show that the area between the x-axis and the graph of $f(x) = 2x + 1$ on the interval $[5, 8]$ can be expressed as the limit of a right Riemann sum. The only variables appearing in your limit should be n and k. You do not need to evaluate this limit.

$$AREA = \lim_{n\to\infty} \sum_{k=1}^{n} \Bigg[\qquad\qquad\qquad\qquad\qquad\qquad \Bigg]$$

6. (10 points) Use a linear approximation to estimate $\ln(0.88)$. Simplify your answer.

7. (10 points) Evaluate the indefinite integral.

$$\int \left(18x^8 - 6\sin x - 4\sec^2 x + 9e^x + 14\right)\, dx$$

8. (10 points) Evaluate the indefinite integral. Hint: Rewrite as the sum of two integrals.

$$\int \frac{10x+2}{25x^2+36}\, dx$$

9. (10 points) Evaluate the indefinite integral.

$$\int \sec^4 x \tan^3 x \, dx$$

10. (10 points) Evaluate the definite integral. Simplify your answer.

$$\int_{-5}^{1} 12 \sin^3(3x + 6) \, dx$$

11. (10 points) Let **R** be the finite region bounded by the graphs of $y = x^2$ and $y = 4x$. Revolve **R** around the vertical line $x = 9$ to form a solid. In the following manner, set up but do not evaluate definite integrals which represent the volume of the solid.

(a) Integrate with respect to x.

(b) Integrate with respect to y. (The integrands in parts (a) and (b) should be different.)

Students – do not write on this page!

1. (8 points) ______________________
2. (8 points) ______________________
3. (8 points) ______________________
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5. (8 points) ______________________
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TOTAL (100 points) ______________