MATH 220  Test 3  Fall 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 11:00-12:50, Derek Jung  ▷ ADD, TR 10:00-11:50, Christopher Linden
▷ AD2, TR 9:00-10:50, Claire Merriman  ▷ ADL, TR 11:00-11:50, Emily Heath
▷ AD3, TR 1:00-2:50, Itziar Ochoa de Alaiza Gracia  ▷ AD, TR 8:00-8:50, Dara Zirlin
▷ ADB, TR 9:00-9:50, Dara Zirlin  ▷ ADT, TR 9:00-9:50, Xujun Liu
▷ ADC, TR 10:00-10:50, Xujun Liu  ▷ ADK, TR 10:00-10:50, Elizabeth Field
▷ ADD, TR 11:00-11:50, Christopher Linden  ▷ ADN, TR 1:00-1:50, Aaron Schneberger
▷ ADE, TR 12:00-12:50, Christopher Linden  ▷ AD, TR 12:00-12:50, Alyssa Loving
▷ ADF, TR 1:00-1:50, Alyssa Loving  ▷ AD, TR 1:00-1:50, Aaron Schneberger
▷ ADG, TR 2:00-2:50, Xianchang Meng  ▷ ADT, TR 1:00-1:50, Argen West
▷ ADH, TR 3:00-3:50, Xianchang Meng  ▷ AD, TR 2:00-2:50, Tigran Hakobyan
▷ ADI, TR 4:00-4:50, Aaron Schneberger  ▷ AD, TR 3:00-3:50, Tigran Hakobyan

FRONT OF ROOM – 114 David Kinley Hall
1. (5 points) Suppose that \( G \) and \( G' \) are each differentiable (and thus continuous) everywhere and that \( p \) and \( q \) are constants. Circle the choice below which most clearly states part 2 of the Fundamental Theorem of Calculus.

(a) \( \int_p^q G'(t) \, dt = G'(q) - G'(p) \)  
(b) \( \int_p^q G(t) \, dt = G'(q) - G'(p) \)

(c) \( \int_p^q G'(t) \, dt = G(q) - G(p) \)  
(d) \( \int_p^q G(t) \, dt = G(q) - G(p) \)

(e) \( \int_p^q G'(t) \, dt = G'(p) - G'(q) \)  
(f) \( \int_p^q G(t) \, dt = G'(p) - G'(q) \)

(g) \( \int_p^q G'(t) \, dt = G(p) - G(q) \)  
(h) \( \int_p^q G(t) \, dt = G(p) - G(q) \)

2. (5 points) If Newton’s Method is used to approximate a solution to the equation \( f(x) = 0 \), then it generates a sequence of approximations \( x_1, x_2, x_3, x_4, \ldots \). Circle the choice below which shows how \( x_n \) can be used to determine the next approximation \( x_{n+1} \).

(a) \( x_{n+1} = \frac{x_n - f'(x_n)}{f'(x_n)} \)  
(b) \( x_{n+1} = x_n - \frac{f'(x_n)}{f(x_n)} \)

(c) \( x_{n+1} = \frac{x_n - f(x_n)}{f'(x_n)} \)  
(d) \( x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)} \)

(e) \( x_{n+1} = \frac{x_n + f'(x_n)}{f(x_n)} \)  
(f) \( x_{n+1} = x_n + \frac{f'(x_n)}{f(x_n)} \)

(g) \( x_{n+1} = \frac{x_n + f(x_n)}{f'(x_n)} \)  
(h) \( x_{n+1} = x_n + \frac{f(x_n)}{f'(x_n)} \)
3. (5 points each) Let $R$ be the finite region bounded by the graphs of $y = 5x$ and $y = 20\sqrt{x}$. These curves intersect at the origin and at the point $(x, y) = (16, 80)$. Revolve $R$ around the vertical line $x = 20$ to form a solid. In the following manner, set up but do not evaluate definite integrals which represent the volume of the solid. Use proper notation.

(a) Integrate with respect to $x$.

(b) Integrate with respect to $y$. (The integrands in parts (a) and (b) should be different.)
4. (10 points) Fill in the missing information to show that the definite integral can be expressed as
the limit of a right Riemann sum. The only variables appearing in your limit should be \( n \) and \( k \).
Do not evaluate the definite integral or the limit.

\[
\int_{5}^{9} (\sin (8x) + 42) \, dx = \lim_{n \to \infty} \sum_{k=1}^{n} \left[ \right.
\]

5. (10 points) Express \( \ln (388) - 2 \ln (20) \) as a single logarithm. Now use a linear approximation
to estimate its value. Simplify and write your answer in decimal form.
6. (10 points) Let \( g(x) = \int_0^{x^3 - 192x} e^{ts} \, dt \). Determine the \( x \)-value for each local maximum on the graph of \( g(x) \).

7. (10 points) Find the average value of the function \( f(x) = \frac{28x}{x^2 + 7} \) on the interval \([3, 5]\). Simplify your answer.
8. (10 points) Evaluate the indefinite integral.

\[ \int \frac{x^9 + x^7 + 42}{x^2 + 1} \, dx \]

9. (10 points) Evaluate the indefinite integral.

\[ \int 72e^{9x} \csc^2 (e^{9x}) \, dx \]
10. (10 points) Evaluate the indefinite integral.

\[ \int 121x (11x + 5)^{42} \, dx \]

11. (10 points) Evaluate the indefinite integral.

\[ \int \sin^3(x) \cos^{13}(x) \, dx \]
Students – do not write on this page!

1. (5 points) 

2. (5 points) 

3a. (5 points) 

3b. (5 points) 

4. (10 points) 

5. (10 points) 

6. (10 points) 

7. (10 points) 

8. (10 points) 

9. (10 points) 

10. (10 points) 

11. (10 points) 

TOTAL (100 points) 