MATH 220 Test 3 Fall 2014

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, Melinda Lanius
▷ AD2, TR 9:00-10:50, Ben Fulan
▷ AD3, TR 1:00-2:50, Mychael Sanchez
▷ ADA, TR 8:00-8:50, Derek Jung
▷ ADB, TR 9:00-9:50, Derek Jung
▷ ADC, TR 10:00-10:50, Andrew McConvey
▷ ADD, TR 11:00-11:50, Andrew McConvey
▷ ADE, TR 12:00-12:50, David Poole
▷ ADF, TR 1:00-1:50, Alonza Terry
▷ ADG, TR 2:00-2:50, Alonza Terry
▷ ADH, TR 3:00-3:50, Argen West
▷ ADI, TR 4:00-4:50, Argen West
1. (5 points) Fill in the missing information to show that the area between the $x$-axis and the graph of $f(x) = 3x + 10$ on the interval $[2, 7]$ 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 this limit.

$$\text{AREA} = \lim_{n \to \infty} \sum_{k=1}^{n} \left[ \right]$$

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 $x_1, x_2, x_3, x_4, \ldots$. Which one of the following correctly shows how $x_n$ can be used to determine the next approximation $x_{n+1}$?

(a) $x_{n+1} = \frac{x_n + f'(x_n)}{f(x_n)}$
(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. (10 points) Evaluate the following indefinite integrals.

(a) $\int \sin x \, dx$
(b) $\int \cos x \, dx$
(c) $\int e^x \, dx$
(d) $\int \frac{1}{x} \, dx$
(e) $\int \sec^2 x \, dx$
(f) $\int \csc^2 x \, dx$
(g) $\int \csc x \cot x \, dx$
(h) $\int \sec x \tan x \, dx$
(i) $\int \frac{1}{1 + x^2} \, dx$
(j) $\int \frac{1}{\sqrt{1 - x^2}} \, dx$
4. (10 points) Let \( g(x) = \int_{-19}^{x^2} (t - 169)^9 (5t - 245)^{37} \, dt \). Determine the \( x \)-value for each local minimum on the graph of \( g(x) \).

5. (10 points) At 4:00 AM, the layer of ice on Lake Mendota has a thickness of 7 inches. Its thickness is increasing at a rate of \( t/4 \) inches per hour where \( t \) represents the number of hours since 4:00 AM. What is the thickness of the ice at 9:00 AM that same day? Write your answer in decimal form.
6. (10 points) Let \( R \) be the finite region bounded by the graphs of \( x = 3y \) and \( y^2 = 16x \). These curves intersect at the origin and at the point \((x, y) = (144, 48)\). Revolve \( R \) around the horizontal line \( y = 72 \) 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.)
7. (8 points) Evaluate the definite integral. Simplify your answer.

\[ \int_{0}^{1} \frac{36x^8}{\sqrt{144x^9 + 25}} \, dx \]

8. (8 points) Evaluate the definite integral. Simplify your answer.

\[ \int_{-\ln 5}^{\ln 5} 50e^{2x} \, dx \]
9. (8 points) Evaluate the indefinite integral.

\[ \int \tan x \sec^4 x \, dx \]

10. (8 points) Evaluate the indefinite integral.

\[ \int 144x (12x + 1)^6 \, dx \]
11. (8 points) Evaluate the indefinite integral.

\[ \int \frac{e^{9x}}{e^{18x} + 1} \, dx \]

12. (10 points) Use a linear approximation to estimate \( e^{3/8} \) and write your answer either in decimal form or as a simplified fraction.
Students – do not write on this page!

1. (5 points) ____________________

2. (5 points) ____________________

3. (10 points) ____________________

4. (10 points) ____________________

5. (10 points) ____________________

6. (10 points) ____________________

7. (8 points) ____________________

8. (8 points) ____________________

9. (8 points) ____________________

10. (8 points) ____________________

11. (8 points) ____________________

12. (10 points) ____________________

TOTAL (100 points) ______________