You may work with other MATH 220 students. However each student should write up solutions separately and independently – nobody should copy someone else’s work.

You may use your notes, the textbook, or information found on my course home page.

You may use a calculator only for basic arithmetic. In particular you should not use its graphing features.

You are not allowed to search the Internet, use Wolfram Alpha, or use technology for anything beyond what is stated above.

There is a higher expectation for the quality of your work on a take-home quiz. Everything should be written logically and legibly with sufficient work to justify each answer. Blank copies of the quiz are available on the course home page.

Be sure that the pages are nicely stapled – do not just fold the corners.

The quiz is due at the beginning of your official discussion period on Tuesday, April 5.

Note to TAs and Tutors – you should not help students with these specific problems until all discussion sections have turned in the quiz.
1. (2 points) Find a formula for \( f(x) \) given that \( f''(x) = 2 \cos x + 5 \sin x \), \( f(0) = 10 \) and \( f(\pi/2) = \pi + 7 \).
2. (2 points) Suppose that $p(x)$ is continuous at all real numbers and satisfies the following equations.

- $\int_{2}^{5} p(x) \, dx = 4$
- $\int_{2}^{10} p(x) \, dx = 13$
- $\int_{10}^{25} p(x) \, dx = 61$
- $\int_{20}^{25} p(x) \, dx = 36$

What is the value of $\int_{5}^{20} (3p(x) - 4) \, dx$?
3. (2 points) Evaluate the following limit. Use proper notation throughout your evaluation of this limit.

\[
\lim_{n \to \infty} \sum_{k=1}^{n} \frac{(3k + 2n)^2}{n^3}
\]
4. (2 points) From section 5.2 we have the following property of definite integrals.

If \( f(x) \) is continuous and \( m \leq f(x) \leq M \) for \( a \leq x \leq b \), then \( m(b-a) \leq \int_a^b f(x) \, dx \leq M(b-a) \)

Use this property to carefully explain why the following inequality holds.

\[
0.6 \leq \int_{-1}^2 \frac{1}{\sqrt{17 + x^3}} \, dx \leq 0.75
\]
5. (2 points) The area between the x-axis and the graph of \( f(x) = \frac{1}{x^3 + 2} \) on the interval \([6, 11]\) can be written as a limit of Riemann sums in many different ways. I have shown how to do this for two of the six ways indicated below. Fill in the missing information for the remaining limits so that the only variables appearing are \( n \) and \( k \). Do not evaluate these limits.

(a) Using a limit of right Riemann sums,

\[
\text{AREA} = \lim_{n \to \infty} \sum_{k=1}^{n} \left[ \frac{1}{(6 + k \cdot \frac{5}{n})^3 + 2} \cdot \frac{5}{n} \right]
\]

(b) Using a limit of right Riemann sums,

\[
\text{AREA} = \lim_{n \to \infty} \sum_{k=0}^{n-1} \left[ \right]
\]

(c) Using a limit of left Riemann sums,

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

(d) Using a limit of left Riemann sums,

\[
\text{AREA} = \lim_{n \to \infty} \sum_{k=0}^{n-1} \left[ \right]
\]

(e) Using a limit of midpoint Riemann sums,

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

(f) Using a limit of midpoint Riemann sums,

\[
\text{AREA} = \lim_{n \to \infty} \sum_{k=0}^{n-1} \left[ \frac{1}{(6 + (k + 0.5) \cdot \frac{5}{n})^3 + 2} \cdot \frac{5}{n} \right]
\]