Instructions. Put your first and last name at the top of your paper. Everyone is to do their own worksheet but only one from each group is graded with the score shared. Be sure to show your work and explain your reasoning. All worksheets from each group will be collected. This worksheet has two sides, and four problems.

1. The function \( v(x) = \sqrt{x} \) models the velocity of a particle in meters/second. Estimate the area under the graph (meaning above the \( x \)-axis) of \( v(x) \) from \( x = 0 \) to \( x = 4 \) using four approximating rectangles and right endpoints (Leave your estimate in exact form). What quantity does the area of under the graph of \( v(x) \) represent? Is the estimate you calculated an overestimate or underestimate of this quantity?

Answer: \( \sqrt{1} + \sqrt{2} + \sqrt{3} + \sqrt{4} \). The area estimate represents the distance traveled by the particle in the first four seconds. Since the graph of \( v(x) = \sqrt{x} \) is increasing, the estimate is an overestimate.

2. Write the sum below in Sigma Notation:

\[
\frac{1}{1} + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \frac{1}{15} + \frac{1}{36}
\]

Answer: \( \sum_{i=1}^{6} \frac{1}{i^2} \)
3. Find the value of the sum $\sum_{i=1}^{n} 5i$ as a function of $n$. (Remember, you can find the formula for the sum of the first $n$ integers in Appendix E, Theorem 3).

Ans: $\frac{5}{2}(n(n + 1))$. (See Theorem 3 in Appendix E)

4. Consider the region $R$ bounded by the line $y = 0$, the graph of $f(x) = x^2 + \sqrt{1 + 2x}$, and the vertical lines lines $x = 4$ and $x = 7$. Find an expression for the area of $R$ as the limit of a summation. Do not evaluate the limit.

Answer:

$$\lim_{n \to \infty} \sum_{i=1}^{n} \left[ ((4 + 3i/n)^2 + \sqrt{1 + 2(4 + 3i/n)}) \right] \cdot \frac{3}{n}$$