1. (10 pts) Find the average value of the function \( f(x) = \sqrt{x} \) on the interval \([0, 4]\). Find \( c \) such that \( f_{\text{ave}} = f(c) \).

2. (15 pts) Find the volume of the solid obtained by rotating the region \( A \) bounded by the curves \( x = 1, x = 2, y = 0, y = \frac{1}{x} \) about the \( x \) axis.

3. (15 pts) Find the radius of convergence and the interval of convergence for the series

\[
\sum_{n=1}^{\infty} \frac{(-2)^n x^n}{\sqrt{n}}
\]

(do not forget to check the endpoints).

4. (10 pts) Express the number \( 3.2485 \) as a ratio of integers.

5. (10 pts) Determine if the following series converges:

\[
\sum_{n=0}^{\infty} \frac{2 + \cos n}{2^n}
\]

6. (15 pts) Determine if the following series converges:

\[
\sum_{n=0}^{\infty} \frac{(-1)^n n^2}{n^3 + 1}
\]

If it does, then does it converge absolutely?

7. (15 pts) Determine if the following series converges:

\[
\sum_{n=0}^{\infty} \frac{n + 1}{\sqrt{n^5 + 10}}
\]

8. (10 pts) Compute the sum of the series \( \sum_{n=1}^{\infty} [(0.1)^n + (0.5)^{n-1}] \).

[Bonus] Let \( f(x) = kx(2 - x) \) if \( 0 \leq x \leq 2 \) and \( f(x) = 0 \) if \( x < 0 \) or \( x > 2 \).
(a) For what values of \( k \) is \( f \) a probability density function?
(b) For that value of \( k \) find \( P(X \geq 0.5) \).
(c) Find the mean.