1. (15 Points) The following questions deal with the integral

\[ \int_0^3 (3 + x - x^2) \, dx \]

(a) Approximate the integral by using a right-hand Riemann sum with 4 rectangles.

(b) Set up the integral as a limit of a right-hand Riemann sum.

(c) Evaluate the integral by evaluating the limit of the right-hand Riemann sum.
2. (15 Points Each) Find the following integrals,

(a) \[ \int_{3}^{5} x^3 - 2x^2 + \frac{1}{x} - \sqrt{x} \, dx \]

(b) \[ \int x \sin(x^2) \cos(x^2) \, dx \]
(c) \( \int_0^{\pi/4} \tan^5(x) \sec^3(x) \, dx \)

(d) \( \int \frac{3x^2 - 2}{x^2 - 2x - 8} \, dx \)
(e) \[ \int \frac{1}{\sqrt{x+1} + \sqrt{x}} \, dx \]

(f) \[ \int x^2 \cos(x) \, dx \]
(g) \( \int_0^\infty x^3 e^{-x^4} \, dx \)
3. (15 Points) Write the integral that will find the arc length of $f(x) = \sin(x^3)$ over the interval $0 \leq x \leq \pi$ but do not evaluate the integral. Use Simpson’s Rule with $n = 6$ subdivisions to approximate this integral and hence approximate the arc length.
4. (15 Points) Find the volume of the solid obtained by rotating the region bounded by \( y = x^3 \), \( y = 8 \) and \( x = 0 \) about the \( x \)-axis.
5. (15 Points Each) Determine if the following series converge or diverge,

(a) \( \sum_{n=1}^{\infty} \frac{n \ln(n)}{(n+1)^3} \)

(b) \( \sum_{n=1}^{\infty} \frac{n^2 + 1}{5^n} \)
6. \textit{(15 Points)} Find the radius and interval of convergence of the following power series.

\[
\sum_{n=0}^{\infty} (-1)^n \frac{(2x - 3)^n}{2n + 5}
\]
7. (15 Points) Find the Taylor series for \( f(x) = \frac{1}{\sqrt{x}} \) centered at \( a = 9 \). Also find its radius and interval of convergence.