Please show all your work in order to receive full credit. No calculators or other electronic devices may be used on the exam.

**Short Answer**

1. (a) State the **Fundamental Theorem of Calculus**.

   (b) What does the FTC say about the relationship between integration and differentiation?

2. (a) What is a **Riemann Sum**?

   (b) How does the Riemann Sum relate to integration and the area under a curve?
Computation

3. The graph of $f$ is shown below.

(a) Use 5 left endpoints to estimate the area under $f$ from $[-1, 1.5]$.

(b) Use 5 right endpoints to estimate the area under $f$ from $[-1, 1.5]$.

(c) Use 10 midpoints to estimate the area under $f$ from $[-1, 1.5]$.

(d) Which of these estimates is the most accurate?
4. Evaluate the following indefinite integrals.

(a) \( \int (\sec^2 x - x^{1/4}) \, dx \)

(b) \( \int (3x - e^x) \, dx \)

(c) \( \int x \sin(x^2) \, dx \)

(d) \( \int \frac{\ln x}{x} \, dx \)

(e) \( \int \frac{\cos(\ln x)}{x} \, dx \)

(f) \( \int \sec^3 x \tan x \, dx \)
5. Evaluate the following definite integrals.

(a) $\int_0^2 \cos(\pi x/2) \, dx$

(b) $\int_1^2 (1 + 2x)^2 \, dx$

(c) $\int_1^9 \frac{1}{x^2} \, dx$

(d) $\int_1^2 x \sqrt{x - 1} \, dx$

(e) $\int_0^{\pi/2} \cos x \sin(\sin x) \, dx$