

1. [2 points] Solve for x : $e^{3x+5} = 2^x$. (Hint: use \ln .)

2. [3 points] Evaluate the following derivatives:

(a) $\frac{d}{dx} \left(3x^4 + 7e^x - \sqrt{x} + \frac{5}{x^2} \right) =$

(b) $\frac{d}{dx} \int_2^x \left(\frac{1}{\sqrt{t}} - e^t \right) dt =$

3. [2 points] Evaluate $\int_1^4 \left(7e^x - \sqrt{x} + \frac{6}{x^4} \right) dx$.

4. [2 points] Which of the following expressions is the **right Riemann sum with n subintervals** for estimating the value of the integral $\int_0^1 \sin(\sqrt{x}) \, dx$?

A: $\sum_{i=1}^n \sin\left(\sqrt{\frac{i}{n}}\right) \frac{1}{n}$
B: $\sum_{i=0}^{n-1} \sin\left(\sqrt{\frac{i}{n}}\right) \frac{1}{n}$
C: $\sum_{i=1}^n \sin\left(\sqrt{\frac{i-1}{n}}\right) \frac{1}{n}$

D: $\sum_{i=1}^n \sin\left(\sqrt{\frac{i+1}{n}}\right) \frac{1}{n}$
E: $\sum_{i=1}^n \sin\left(\sqrt{\frac{i}{n}}\right) \frac{1}{2n}$
F: $\sum_{i=0}^{n-1} \sin\left(\sqrt{\frac{i}{n}}\right) \frac{1}{2n}$

5. [2 points] Consider the velocity data of a car in the table below.

t (s)	0	2	4	6	8
v (m/s)	14	10	8	-2	-4

Compute the **left** Riemann sum with 4 subintervals of $\int_0^8 v(t) \, dt$. Include the unit of measurement in your answer.

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6. [2 points] Suppose

$$\int_0^9 f(x) \, dx = 3 \quad \text{and} \quad \int_7^9 f(x) \, dx = -4.$$

Evaluate $\int_0^7 (3f(x) + 2) \, dx$.

7. [4 points]

(a) State the definition of the derivative of a function f at an arbitrary point x in the domain.

(b) Use the definition of the derivative to find $f'(x)$ if $f(x) = \frac{2}{3x-1}$. Write your solution correctly, logically, and clearly.

8. [3 points] We are given the function

$$g(x) = \begin{cases} x^2 & \text{if } 0 \leq x < 2 \\ 4 & \text{if } 2 \leq x < 4 \\ 12 - 2x & \text{if } 4 \leq x \leq 8. \end{cases}$$

Evaluate $\int_0^8 g(x) \, dx$.