Name: 

- No calculators allowed.
- Show sufficient work to justify each answer.
- You have 15 minutes for this quiz.

1. (1 point) Given that \( \int_{5}^{8} e^{x} \sin^{2} x \ln x \, dx = 3698.88 \), what is the value of \( \int_{5}^{8} e^{x} \sin^{2} x \ln x \, du \)?

\[
\int_{5}^{8} e^{x} \sin^{2} x \ln x \, dx - \int_{5}^{8} e^{x} \sin^{2} x \ln x \, du = -3698.88
\]

2. (1 point) If \( f(6) = 13 \), \( f' \) is continuous and \( \int_{2}^{6} f'(x) \, dx = 5 \), what is \( f(2) \)?

By FTC,

\[
\int_{2}^{6} f'(x) \, dx = f(6) - f(2)
\]

So,

\[
5 = 13 - f(2)
\]

\[
f(2) = 13 - 5 = 8
\]

3. (2 points) Fill in the missing information to show that the given definite integral can be expressed as the limit of a Riemann sum. The only variables appearing in your limit should be \( n \) and \( k \). You do not need to evaluate this limit.

\[
\int_{-1}^{4} \frac{\ln x}{x^3 + 7} \, dx = \lim_{n \to \infty} \sum_{k=1}^{n} f(x_k) \Delta x
\]

\[
\Delta x = \frac{4 - (-1)}{n} = \frac{5}{n}
\]

Using right end points \( x_k = -1 + k \Delta x = -1 + \frac{5k}{n} \)

\[
\int_{-1}^{4} \frac{\ln x}{x^3 + 7} \, dx = \lim_{n \to \infty} \sum_{k=1}^{n} f(x_k) \Delta x
\]

\[
= \lim_{n \to \infty} \sum_{k=1}^{n} \frac{\ln(-1 + \frac{5k}{n})}{(-1 + \frac{5k}{n})^3 + 7} \cdot \frac{5}{n}
\]
4. (3 points) Evaluate the following indefinite integral.

\[ \int \tan x \cos x \, dx \]

\[ \int \tan x \cos x \, dx = \int \frac{\sin x}{\cos x} \cos x \, dx \]

\[ = \int \sin x \, dx \]

\[ = -\cos x + C \]

5. (3 points) At 9:00AM, Sue starts collecting donations for her charity. She collects money at a rate of \(9t^2 - 2t + 1\) dollars per hour, where \(t\) denotes the number of hours since 9:00AM. What is the total amount of money that Sue collects between 10:00AM and 12:00AM? Simplify your answer as much as possible without the use of a calculator.

Using the net change theorem:

\[ \text{net \$ collected} = \int_{t=1}^{t=3} (9t^2 - 2t + 1) \, dt \]

\[ = \left[ \frac{9t^3}{3} - \frac{2t^2}{2} + t \right]_{1}^{3} \]

\[ = 3t^3 - t^2 + t \bigg|_{1}^{5} \]

\[ = (3(3)^3 - 3^2 + 3) - (3(1)^3 - (1)^2 + 1) \]

\[ = (81 - 9 + 3) - (1 - 1 + 1) \]

\[ = 72 \]

\[ $72 \]