

MATH 105 101 Midterm 2 Sample 1

1. (20 marks)

(a) (5 marks) Find the derivative of the function:

$$F(x) = \int_1^{\ln(x)} \sqrt{4 + 2t + \sin(t)} dt,$$

at the point $x = 1$. **Simplify the answer.**

(b) (5 marks) Use Simpson's Rule to approximate

$$\int_0^\pi \sin(x) dx$$

with $n = 4$ subintervals. **Simplify the answer.**

(c) (5 marks) Find the definite integral

$$\int_{-2}^1 \frac{5}{x^3} dx.$$

(d) (5 marks) Find the indefinite integral

$$\int x^2 \ln(x) dx.$$

2. (10 marks)

(a) (8 marks) Compute the Left Riemann sum for $f(x) = x + 2$ on the interval $[-2, 4]$ using n equal subintervals. Use the summation identities to simplify the answer.(b) (2 marks) Use the answer in part (a) to evaluate $\int_{-2}^4 (x + 2) dx$. *An answer without making use of part (a) will be given zero marks.*

3. (10 marks) Solve the initial value problem:

$$\frac{dy}{dt} = \frac{e^y(3t + 11)}{t^2 - t - 6}, \quad y(2) = 0.$$

You may leave the answer in its implicit form.

4. (10 marks) Evaluate the definite integral:

$$\int \frac{\sqrt{25x^2 - 4}}{x} dx.$$