

Name (Last, First Middle): _____

Use of books, notes or calculators is NOT permitted. Show all your work! Answers without appropriate supporting work may not receive full credit. Clearly indicate your answers to each problem by underlining them or placing a box around your answers!

1. [50] Find $\int x^2 \sin(x^3 + 1) dx$.

$$x^3 + 1 = u \Rightarrow 3x^2 dx = du \Rightarrow x^2 dx = \frac{du}{3}$$

$$\int \sin u \frac{du}{3} = -\frac{1}{3} \cos u + C = \boxed{-\frac{1}{3} \cos(x^3 + 1) + C}$$

2. [50] Calculate $\int_1^e \frac{\ln x}{x} dx$

$$u = \ln x \Rightarrow du = \frac{1}{x} dx$$

$$\int_1^e \frac{\ln x}{x} dx = \int_{0(=\ln 1)}^{1(=\ln e)} u du = \frac{u^2}{2} \Big|_0^1 = \boxed{\frac{1}{2}}$$

$$\ln 1 = 0$$

$$\ln e = 1$$