

Name: _____

Key

Show all work clearly and in order. Please box your answers.

SOLVE ONE OF THE FOLLOWING:

Please indicate which problem you do NOT want me to grade by putting a GIANT X through it, otherwise I will grade the first side worked on:

1. Evaluate $\int \frac{x^2}{1+x^3} dx$.

$$\begin{aligned}
 & \left(\begin{array}{l} u = 1 + x^3 \Rightarrow \frac{du}{dx} = 3x^2 \Rightarrow dx = \frac{du}{3x^2} \\ \downarrow \end{array} \right. \\
 & \int \frac{x^2}{u} \cdot \frac{du}{3x^2} = \frac{1}{3} \int \frac{1}{u} du = \frac{1}{3} \ln|u| + C \\
 & = \boxed{\frac{1}{3} \ln|1+x^3| + C}
 \end{aligned}$$

2. Find the average value of $f(x) = xe^{x^2}$ over $[0, 2]$.

$$f_{\text{ave}} = \frac{1}{2-0} \int_0^2 x e^{x^2} dx$$

$$= \frac{1}{2} \int_0^2 x e^{x^2} dx$$

$$\left(\begin{array}{l} u = x^2 \Rightarrow \frac{du}{dx} = 2x \Rightarrow dx = \frac{du}{2x} \\ \downarrow \\ u(0) = 0 \\ u(2) = 4 \end{array} \right.$$

$$= \frac{1}{2} \int_0^4 x e^u \cdot \frac{du}{2x} = \frac{1}{4} \int_0^4 e^u du$$

$$= \frac{1}{4} [e^u]_0^4$$

$$= \frac{1}{4} (e^4 - e^0) = \boxed{\frac{1}{4} (e^4 - 1)}$$