Quiz #4

1) Use u-sub to find u and rewrite the integrals in terms of u. Show work! Do not have to solve the integrals.

a) \( \int \frac{6x^2 + 12x}{x^3 + 3x^2 + 7} \, dx \) \hspace{1cm} 2 pts

b) \( \int \cot(5x) \, dx \) \hspace{1cm} 2 pts

2) Find the area of region bounded by \( y = \frac{1}{x \ln(x^2)} \), \( y = 0 \), \( x = e \), \( x = e^5 \). Simplify the answer as much as possible! \hspace{1cm} 5 pts

3) As usual. Fold your paper lengthwise. Put your name and class hours outside. \hspace{1cm} 1 pt
Answer Key #4

1)
   a) \[ \int \frac{6x^2 + 12x}{x^3 + 3x^2 + 1} \, dx \]
   \[ u = x^3 + 3x^2 + 1 \]
   \[ du = 3x^2 + 6x \]
   \[ = \int \frac{2}{u} \, du \]
   \[ = \ln|u| + C \]
   \[ = \ln|x^3 + 3x^2 + 1| + C \]

   b) \[ \int \cot(5x) \, dx = \int \frac{\cos 5x}{\sin 5x} \, dx \]
   \[ u = \sin 5x \]
   \[ du = 5\cos 5x \, dx \]
   \[ = \int \frac{1}{5u} \, du \]
   \[ = \frac{1}{5} \ln|u| + C \]
   \[ = \frac{1}{5} \ln|\sin 5x| + C \]

2) \[ \int_{e}^{e^5} \frac{1}{x \ln(x)} \, dx = \int_{e}^{e^5} \frac{1}{\ln x \cdot x \cdot \ln x} \, dx \]
   \[ = \int_{1}^{5} \frac{1}{u} \, du = \frac{1}{1} \ln(u) \bigg|_{1}^{5} \]
   \[ = \ln(5) - \ln(1) \]
   \[ = \ln(5) \]

   \[ u = \ln x \]
   \[ du = \frac{1}{x} \, dx \]
   \[ x = e \Rightarrow u = 1 \]
   \[ x = e^5 \Rightarrow u = 5 \]