Math 106 Quiz # 10 17 Apr 08

Name :_________________________________________________________
Recitation Section :______________________________________________

Solve the following problems. Show your work and use correct notation.

1. Evaluate the following expressions:

   a) \[\int_0^{\ln 3} e^{2x} \, dx\]  
b) \[\frac{d}{dx} \int_0^{x^2} \cos(e^t) \, dt\]  
c) \[\int \sqrt{6 - 2s} \, ds\]

Solution:

(a) Taking the antiderivative and evaluating at the bounds,

\[
\int_0^{\ln 3} e^{2x} \, dx = \left[ \frac{1}{2} e^{2x} \right]_0^{\ln 3} = \frac{1}{2} \left[ e^{2\ln 3} - e^0 \right] = \frac{1}{2} \left[ e^{\ln 9} - 1 \right]
\]

= \frac{1}{2} [9 - 1] = 4

(b) Make the substitution \( u = x^2 \), and using the chain rule and the fundamental theorem of calculus,

\[
\frac{d}{dx} \int_0^{x^2} \cos(e^t) \, dt = \frac{d}{du} \int_0^{u} \cos(e^t) \, dt \cdot \frac{du}{dx} = \cos(e^u) \cdot \frac{du}{dx} = \cos(e^{x^2}) \cdot 2x
\]

(c) Make the substitution \( u = 6 - 2s \), where \( ds = -du/2 \), and take the antiderivative to get

\[
\int \sqrt{6 - 2s} \, ds = - \int \frac{\sqrt{u}}{2} \, du = -\frac{2}{6} (u)^{3/2} = -\frac{1}{3} (6 - 2s)^{3/2}
\]