Math 180 – Fall 2012 Name: Solutions

Quiz 11

Write your answers on this page. Continue on the back if you need more space.

(5 pts) **1.** Evaluate the indefinite integral: $\int \frac{\sin(e^{-2x})}{e^{2x}}dx$

Let $u = e^{-2x}$

$du = -2e^{-2x}\,dx$

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

$$\int \frac{\sin(e^{-2x})}{e^{2x}}dx = -\frac{1}{2}\int \sin(e^{-2x}) \cdot \underbrace{(-2)\cdot\frac{1}{e^{2x}}dx}_{du}$$

$$= -\frac{1}{2}\int \sin(u)\,du = -\frac{1}{2}(-\cos(u)) + C$$

$$= \boxed{\frac{1}{2}\cos(e^{-2x}) + C}$$

(5 pts) **2.** Evaluate the definite integral: $\int_{1/3}^{e/3} \frac{1}{3x}dx$. Simplify your answer.

Let $u = 3x$ $\quad x = \frac{1}{3} \Rightarrow u = 1 \quad x = \frac{e}{3} \Rightarrow u = e$

$du = 3dx$

$$\frac{1}{3}\int_{1/3}^{e/3} \frac{1}{3x}\cdot 3dx = \frac{1}{3}\int_1^e \frac{1}{u}du = \frac{1}{3}\ln|u|\Big]_1^e$$

$$= \frac{1}{3}\left[\ln(e) - \ln(1)\right] = \frac{1-0}{3} = \boxed{\frac{1}{3}}$$

OR: $$\int_{1/3}^{e/3} \frac{1}{3x}dx = \frac{1}{3}\int_{1/3}^{e/3}\frac{1}{x}dx = \frac{1}{3}\Big[\ln|x|\Big]_{1/3}^{e/3}$$

$$= \frac{1}{3}\left[\ln\left(\frac{e}{3}\right) - \ln\left(\frac{1}{3}\right)\right] = \frac{1}{3}\left[\underbrace{\ln(e)}_{1} \cancel{+\frac{1}{3}} - \underbrace{\ln(1)}_{0} \cancel{-\frac{1}{3}}\right] = \boxed{\frac{1}{3}}$$