Quiz #1 (CSE 400.001)

Monday, September 12, 2012

Name: _____ **E-mail:** _____

Dept: _____ **ID No:** _____

1. (6 points) Solve the following initial value problem:

$$(\cos x + \sin x)dx + e^x dy = 0,\ y(0) = 1.$$

$P(x,y) = \cos x + \sin x$, $Q(x) = e^x$] +1

$R(x) = \frac{1}{Q}(P_y - Q_x) = -1$

$F(x) = \exp\left(\int(-1)dx\right) = e^{-x}$] +1

$e^{-x}(\cos x + \sin x)dx + dy = 0$

$u(x,y) = y + l(x)$ +1

$u_x = l'(x) = e^{-x}(\cos x + \sin x)$] +1

$l(x) = -e^{-x}\cos x + c$

$u(x,y) = y - e^{-x}\cos x = c$ +1

$u(0,1) = 1 - 1 = c$] +1

$\therefore u(x,y) = y - e^{-x}\cos x = 0$

2. (4 points) Solve the following initial value problem:

$$xy' + 2y = 4x^2, \; y(1) = 2.$$

$y' + \frac{2}{x}y = 4x$, $y(1) = 2$ (+1)

$h(x) = \int p(x)\,dx = \int \frac{2}{x}\,dx = \ln|x|^2$ (+1)

$y(x) = e^{-h(x)}\left[\int e^{h(x)} \cdot r(x)\,dx + C\right]$

$= \frac{1}{x^2}\left[\int 4x^3\,dx + C\right]$ (+1)

$= x^2 + \frac{C}{x^2}$

$2 = 1 + \frac{C}{1} \Rightarrow C = 1$ (+1)

$\therefore y(x) = x^2 + \frac{1}{x^2}, \quad x > 0$