Kingdom of Saudi Arabia **Ministry of Higher Education** **KING SAUD UNIVERSITY** **Colleg of Sciences** ***Departement of Mathematics***		**المملكة العربية السعودية** وزارة التعليم العالي **جامعة الملك سعود** كلية العلوم قسم الرياضيات

MATH 204
HOMEWORK ASSIGNMENT No1
Due date: 22/03/2008

Question 1. **a)** Determine a region of the xy-plane, where the DE: $\sqrt{y}\frac{dy}{dx}-\sqrt{x+1}=0$, has a unique solution through every point (x_0,y_0) in the region.

b) Find a curve having the slope $\frac{dy}{dx}=\sqrt{\frac{x+1}{y}}$, and passing through the point $(0,4)$.

Question 2. **a)** Verify that $3x^2-y^2=c$ is a one parameter family of solutions of the DE: $yy'=3x.$

b) By hand sketch the graph of the implicit solution $3x^2-y^2=3$. Find all explicit solutions $y=\phi(x)$ of the DE in part (a) defined by this relation. Give the interval I of definition of each explicit solution.

c) The point (-2,3) is on the graph of $3x^2-y^2=3$, but which of the explicit solutions in part b) satisfies $y(-2)=3.$

Question 3. **a)** Find a function $y=f(x)$ whose graph at each point (x,y) has the slope given by $8e^{2x}+6x$ and has the y-intercept (0,9).

b) Determine the value of x_0 for which the graph of the solution of the initial value problem: $\begin{cases} y'+2y=3x-6 \\ y(x_0)=0 \end{cases}$ is tangent to the x-axis at $(x_0,0).$

Question 4. a) *)* Determine whether the following initial value problem has a unique solution $y'=y+(\sin x)^2,\quad y(\pi)=1$**.**

b) Solve thé DE**:** $y'=\frac{xy^2-\cos x.\sin x}{y(1-x^2)}$ **.**

Question 5. a) Solve the initial value problem $\begin{cases} y^{1/2}\dfrac{dy}{dx} + y^{3/2} = 1 \\ y(0) = 4 \end{cases}$

b) Find the general solution of the differential equation $\dfrac{dy}{dx} = \dfrac{-2xy^3 - 2}{3x^2y^2 + 3}$.

Question 6. a) By using a special integrating factor, solve the differential equation: $ydx + (3 + 3x - y)dy = 0$.

b) Find the general solution of the DE: $(y - x + xy\cot x)dx + xdy = 0, \quad 0 < x < \pi$

Question 7. In A) and B) find the general solution of the given DE. Give the largest interval I over which the general solution is defined.

A) $(\cos x)^2 \sin x \dfrac{dy}{dx} + y(\cos x)^3 = 1$

B) $(x^2 - 1)y' + 2y = (x+1)^2$