Differential Equations I Homework 3   05.12.2016

1. Find the general solution of the differential equation

(a) $y'' + (y')^2 + 1 = 0$ $Ans: y = c_1 + \ln\cos(x - c_2)$

(b) $\left(1 + x^2\right)y'' + 2xy' = \dfrac{2}{x^3}$ $Ans: y = c_1 + c_2 \arctan x + \dfrac{1}{x}$

(c) $xy'' - y' = \dfrac{-2}{x} - \ln x$ $Ans: y = c_1 x^2 + c_2 + (x+1)\ln x$

(d) $y''' + y'' = x^2$ $Ans: y = c_1 e^{-x} + c_2 x + c_3 + \dfrac{x^2\left(x^2 - 4x + 12\right)}{12}$

(e) $yy'' + (y')^3 = 0$ $Ans: x = c_1 + c_2 y + y\ln y$

(f) $yy'' + (y')^2 = 2$ $Ans: y^2 = 2x^2 + c_1 x + c_2$

2. Find the general solution of the differential equation by using the method undetermined coefficients

(a) $y'' + 4y = 4e^{2x} + 8\sin 2x$

(b) $y'' - y = 12e^{2x} + e^x \sin 2x$

(c) $y''' + 3'' + 2y' = -18x^2 + 6x$

(d) $y''' - y'' - 4y' + 4y = 2x^2 - 4x - 1$

(e) $y'' - 4y' + 4y = 8x^3 e^{2x} + 12e^{-x} - 9x + 8$

(e) $y'' - 6y' + 9y = x^4 e^x + x^3 e^{2x} + x^2 e^{3x}$

(g) $y'' + 9y = e^{3x} + e^{-3x} + e^{3x}\sin 3x$

(h) $y^{(iv)} + 2y'' + y = x^2 \cos x$

(i) $y^{(iv)} + 10y'' + 9y = \sin x \sin 2x$

(h) $y^{(vi)} + 2y^{(v)} + 5y^{(iv)} = x^3 + x^2 e^{-x} + e^{-x}\sin 2x$

3. Find the general solution of the differential equations

(a) $\left(xp\right)^2 + xyp - 6y^2 = 0$

(b) $xp^2 + \left(y - x^2 - 1\right)p - x\left(y - 1\right) = 0$

(c) $xp^2 - 2yp + 4x = 0$

(d) $\left(yp\right)^2 + 3xp - y = 0$

(e) $p^2 - xp + y = 0$

(f) $y = \left(1 + p\right)x + p^2$

4. Find the general solution of the Bernouille differential equations and solutions with given initial

conditions.

(a) $\dfrac{dy}{dx} + \dfrac{y}{2x} = \dfrac{x}{y^3}$, $\quad y(1) = 2$

(b) $x\dfrac{dy}{dx} + y = \left(xy\right)^{3/2}$, $\quad y(1) = 4$

(c) $x^2\dfrac{dy}{dx} + xy = \dfrac{y^3}{x}$, $\quad y(1) = 1$

(d) $4xy\dfrac{dy}{dx} = y^2 + 1$, $\quad y(2) = 1$

Differential Equations I Final Exam 25.12.2015

1. $x^2\left(x + 1\right)\dfrac{d^2 y}{dx} - x\left(2x + 3\right)\dfrac{dy}{dx} + \left(2x + 3\right)y = 0$ is given.

(a) Find a particular solution in the form $y = x^n$ of the given differential equation. *(05p)*

(b) By using **(a)** find general solution of the given differential equation. *(20p)*

2. Find the general solution of the Cauchy-Euler differential equation *(25p)*

$$x^2\dfrac{d^2 y}{dx} + 2x\dfrac{dy}{dx} - 2y = 4x\ln x - 5\cos\left(\ln x\right)$$

3. Find the general solution of the differential equation by using **variation of parameters.** *(20p)*

$$\frac{d^2y}{dx} - y = 4$$

4. Find the general solution of the differential equation: $\frac{d^3y}{dx^3} - \left(\frac{d^2y}{dx^2}\right)^2 = 0$ *(15p)*

5. Find the general solution of the differential equation: $y\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^2 + y^2$, $\left(write\ \frac{dy}{dx} = uy\right)$

Duration 90 min.   *GOOD LUCK!...*   *Dr. Cemal ÇİÇEK*

Differential Equations I Final Exam (Gece)   04.01.2016

1. $x\left(x^2 + 1\right)\frac{d^2y}{dx^2} + 2\left(x^2 - x + 1\right)\frac{dy}{dx} - 2y = 0$ is given.

   (a) Find a particular solution in the form $y = x^n$ of the given differential equation. *(05p)*

   (b) By using **(a)** find general solution of the given differential equation. *(20p)*

2. Find the general solution of the Cauchy-Euler differential equation   *(25p)*

$$x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 9x\ln x + 4\cos\left(\ln x\right)$$

3. Find the general solution of the differential equation by using **variation of parameters.** *(20p)*

$$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = -4$$

4. Find the general solution of the differential equation: $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} + 1 = 0$ *(15p)*

5. Find the general solution of the differential equation: $y\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^2 - 4y^2$, $\left(write\ \frac{dy}{dx} = uy\right)$

Duration 90 min.   *GOOD LUCK!...*   *Dr. Cemal ÇİÇEK*

Differential Equations I Midterm Exam   13.11.2015

1. Find the general solution of the homogeneous differential equation

$$\frac{dy}{dx} = \frac{y}{2x} + \frac{y^2}{x^2} \qquad \text{by using the substitution } y = ux. \textbf{\textit{(20p)}}$$

2. Find the general solution of the differential equation   **_(20p)_**

$$\frac{dy}{dx} = \frac{x-y+1}{y-x+1}$$

3. (a) Is the differential equation

$$(2e^y - 3x\sin y)dx + (xe^y - x^2\cos y)dy = 0 \quad \text{exact? } \textbf{\textit{(05p)}}$$

(b) If not exact, find an integrating factor $\mu = \mu(x)$.   **_(10p)_**

(c) Find the solution of the given differential equation .   **_(05p)_**

4. Find the general solution of the Bernoulli equation

$$\frac{dy}{dx} - \frac{y}{x} = y^2 x\sin x \quad \textbf{\textit{(20p)}}$$

5. Find the general and singular(if exist) solutions of the Clairaut equation

$$y = xp - \sqrt{p}, \qquad \text{where } p = \frac{dy}{dx} \qquad \textbf{\textit{(05p+05p)}}$$

6. (a) Verify that the primitive $y = c_1 + c_2 e^{-x}$ contains two independent parameters. **_(05p)_**

(b) Find the second order differential equation of which this function is the general slution. **_(05p)_**

Differential Equations I Midterm Exam   19.11.2015

1. Find the general solution of the homogeneous differential equation

$$(y^2 - 2xy + 4x^2)dx - 2x^2 dy = 0 \qquad \text{by using the substitution } y = ux. \textbf{\textit{(25p)}}$$

2. Find the general solution of the Bernoulli equation

$$\frac{dy}{dx} + \frac{2y}{x} = 2x^3 y^2 \quad \textbf{(25p)}$$

3. (a) Is the differential equation

$$(3y^2 + 3y - 4xy)dx + (x + 2xy - x^2)dy = 0 \quad \text{exact?} \ \textbf{(05p)}$$

(b) If not exact, find an integrating factor $\mu = \mu(x)$. **(10p)**

(c) Find the solution of the given differential equation . **(10p)**

4. Find the general and singular(if exist) solutions of the Clairaut equation

$$y = xp - sinp , \quad \text{where} \ \ p = \frac{dy}{dx} \qquad \textbf{(05p+05p)}$$

5. (a) Verify that the primitive $y = c_1 sin2x + c_2 cos2x$ contains two independent parameters. **(10p)**

(b) Find the second order differential equation of which this function is the general slution. **(05p)**

Duration 60 min.   *GOOD LUCK!...*   *Dr. Cemal ÇİÇEK*

Diferansiyel Denklemler I Telafi Sınavı (Mat.-II.Öğretim)   10.02.2011

1. $\left(y'' \right)^2 - \left(y' \right)^2 = 1$ diferansiyel denkleminin genel çözümünü bulunuz. **(25p)**

2. $x^2 y'' - 6y = 10x^3 - 375\left(\dfrac{\ln x}{x} \right)^2$ Euler denkleminin genel çözümünü bulunuz **(25p)**.

3. $y''' + 9y' = 18 Co \sec(3x)$ denkleminin genel çözümünü bulunuz **(25p)**.

4. $y' - ay = f(x)$ denkleminin $y(1) = 0$ gerçekleyen çözümü $y(x) = -\displaystyle\int_{x}^{1} e^{a(x-t)} f(t) dt$ şeklindedir,

gösteriniz. $f\left(x\right)$, $\left[0,1\right]$'de sürekli bir fonksiyondur. (Denklemi gerçeklediğini göstermiyorsunuz)

Süre 90 dk   **BAŞARILAR……..**   Yrd. Doç. Dr. Cemal ÇİÇEK

GOOD LUCK!...   *Dr. Cemal ÇİÇEK*