HOMEWORK 9 - MATH 112

DUE DATE: Tuesday, April 18

INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each problem will be chosen at random and graded. Each question is worth 1 point. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Use integration by parts to compute the following integrals:

$$(a)\ \int xe^{-x}dx \quad (b)\ \int x^2e^x dx \quad (c)\ \int \ln(x^2)dx \quad (d)\ \int x^{2006}\ln x dx$$

2. Use partial fraction expansions to compute the integrals:

   (a) $\int \frac{3}{x^2+x-2}dx$

   (b) $\int_0^1 \frac{3}{2x^2+5x+2}dx$

3. Use implicit differentiation to verify that the equation is a solution of the differential equation for any value of C.

   (a) $y^2+2xy-x^2=C, \quad (x+y)y'-x+y=0$

   (b) $x^2-y^2=C, \quad y^3y''+x^2-y^2=0$

4. Verify that the general solution satisfies the differential equation. Then find the particular solution that satisfies the initial condition.

   (a) General Solution: $y=C_1x+C_2x^3$
   Differential Equation: $x^2y''-3xy'+3y=0$
   Initial Condition: $y=0$ and $y'=4$ when $x=2$.

   (b) General Solution: $y=(C_1+C_2x+\frac{1}{12}x^4)e^{2x}$
   Differential Equation: $y''-4y'+4y=x^2e^{2x}$
   Initial Condition: $y=2$ and $y'=1$ when $x=0$.

5. Use integration to find the general solution of the differential equation:

$$(a)\ \frac{dy}{dx}=\frac{1}{2-7x} \quad (b)\ \frac{dy}{dx}=x\sqrt{3x-5} \quad (c)\ \frac{dy}{dx}=11xe^{3x}$$

6. Use separation of variables to find the general solution of the differential equation

$$(a)\ \frac{dy}{dx}=x^2y \quad (b)\ (1+y)\frac{dy}{dx}-4x=0 \quad (c)\ \frac{dy}{dx}=\frac{x^2+2}{3y^2} \quad (d)\ yy'-2xe^x=0$$

7. Use the given initial condition to find the particular solution of the differential equation.

   (a) $yy'-e^x=0, \quad y=4$ when $x=0$

   (b) $\sqrt{x}+\sqrt{y}y'=0, \quad y=4$ when $x=1$

   (c) $\frac{dy}{dx}=x^2(1+y), \quad y=3$ when $x=0$.

8. Solve the differential equations

$$(a)\ \frac{dy}{dx}+5y=15 \quad (b)\ \frac{dy}{dx}+3y=e^{-3x} \quad (c)\ \frac{dy}{dx}+\frac{2y}{x}=3x+1 \quad (d)\ xy'+y=x^2\ln x$$