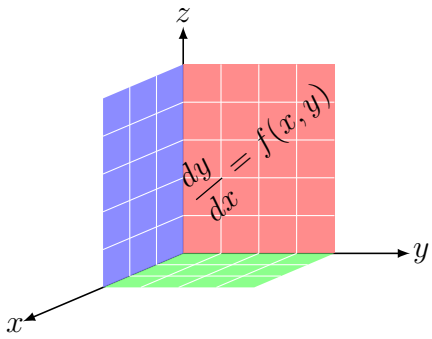

ENG227 ENGINEERING MATHEMATICS
MIDTERM EXAM

April 4, 2017

Name: _____ **Be sure to show your work!**

1. Specify the type of the differential equation : $(1+x^2)dy = (x+xy^2)dx$ and find the general solution. Show your work in detail.

2. Specify the type of the differential equation :$(\sin x)y' + (\cos x)y = \ln x$ and find the general solution. Show your work in detail.

3. Make a suitable change of variable and find the general solution of $\dfrac{dy}{dx} = \dfrac{x+y+1}{x+y-1}$.

4. Specify the type of the differential equation : $x\dfrac{dy}{dx} + y = x^2y^2$ and find the general solution. Show your work in detail.

5. Determine whether or not the differential equation : $(e^x \sin y - 2y\sin x) + (e^x \cos y + 2\cos x)y' = 0$ is exact. Solve it.

6. Specify the type of the differential equation $y' = 1 + (y/x) + (y/x)^2$ and find the general solution. Show your work in detail.

7. Solve initial value problem

$$y' = \frac{yx^5}{2+x^6}$$
$$y(1) = 1$$

8. Consider the differential equation $(2x+3) + (2y-2)y' = 0$. Determine whether this equation is exact or not. If it is, solve it.

9. Consider the differential equation $(ye^{2xy}+x)+axe^{2xy}y' = 0$. Determine for which value of a this equation is exact, and then solve it with this value of a.

10. Consider the differential equation $(ye^{2xy}+x)+axe^{2xy}y' = 0$. Determine for which value of a this equation is exact, and then solve it with this value of a.

11. Consider the differential equation $(2xy - y^3) + (x^2 - 3xy^2)y' = 0$. Determine whether this equation is exact or not. If it is, solve it.

12. Specify the type of the differential equation : $\dfrac{dy}{dx} + xy = xe^{-x^2}y^{-3}$ and find the general solution. Show your work in detail.

13. Specify the type of the differential equation :

$$y' = y(1-y)$$
$$y(0) = 1/2$$

and find the general solution. Show your work in detail.

14. Specify the type of the differential equation : $y' + 2y = cos(3x)$ and find the general solution. Show your work in detail.

15. On what interval we expect unique solutions to

$$y' = \frac{y^2}{1-x^2}$$
$$y(0) = 0$$

Show your work in detail.

16. Specify the type of the differential equation : $y' = xe^{x^2-lny^2}$ and find the general solution. Show your work in detail.

17. Find the differential equation of all circles of radius 1

18. Show that the function

1. $y = C_1 \sin(\pi x) + C_2 \cos(\pi x)$, where C_1 and C_2 are constants, is a solution of the differential equation: $y'' + \pi^2 y = 0$.
2. Solve the initial value problem:

$$y'' + \pi^2 y = 0, \;\; y(0) = 1, \; y'(0) = -1$$