Math 45, Fall 2020 September 9, Quiz 02 Name: Matthew Mendoza

Please show and explain your work where necessary. Good luck!!

1. (*3 points*) Circle all of the following expression which are ordinary differential equations.

(i) $\ln(y')y + x^2y = 1$

(ii) $\frac{\partial f}{\partial x} + \frac{\partial f}{\partial y} - x^2y = 0$

(iii) $x^2\frac{d^3f}{dx^3} + \frac{df}{dx} + \cos(x) = \frac{d^2f}{dx^2}$

(iv) $e^{y''} - y' + y - 1 = 0$

(v) $\sin\left(\frac{\partial g}{\partial x}\right)\frac{\partial f}{\partial y} = e^{x^2+y^2}$

(vi) $y^{(2)} + y' - y = 0$

does not have $\frac{dy}{dx}$

2. (*3 points*) Circle all of the following expression which are linear differential equations.

(i) $\cos(y')y + y = e^x$ Power series

(ii) $\sin(x)\frac{d^4f}{dx^4} + \frac{df}{dx} + x^3 + \frac{d^2f}{dx^2} = 0$

(iii) $y^{(3)}y' - y = 3$ of form $y''\cdot y'$

(iv) $e^{y'} - y'' + y - 1 = 0$

(v) $(y')^2 + y = 0$

(vi) $g(t)\left(\frac{dg}{dt}\right) - g(t) = 0$

Powers more than one

3. (*3 points*) State the order of the following differential equations.

(i) $e^{y'}y + y = x$  *Order:* first

(ii) $\frac{d^5g}{dt^5} - \frac{dg}{dt} + g(t) = 0$ *Order:* fifth

(iii) $\left(\frac{df}{dx}\right)^3 + \frac{df}{dx} + \cos(x) = \frac{d^2f}{dx^2}$ *Order:* second

(iv) $e^{y'''} - y' + y - 1 = 0$ *Order:* third

(v) $(y'')y + yx^2 = 0$ *Order:* second

(vi) $y^{(4)} - y' - y^2 = 0$ *Order:* Fourth

4. (*1 point*) Provide an example of a nonlinear partial differential equation.

$$\left(\frac{d^2y}{dx^2}\right)^2 + f = 0$$