

Answer Key

Form A

Form B

1. a) 1st order
 b) Nonlinear yy' No
 c) No
 d) No
 e) No
2. D
 3. A
 4. A
 5. B
 6. C
 7. B
 8. A

1. a) 1 order
 b) yes
 c) yes
 d) No
 e) yes
2. B
 3. C
 4. D
 5. C
 6. A
 7. A
 8. D

#9 a) $e^y + [xe^y - \sin(y)] \frac{dy}{dx} = 0$ Total +3

+1 +2

b) Check $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} = e^y$ +3

c) $\Phi(x,y) = xe^y + \cos(y) = C_1$

+2 Integrating $\frac{\partial \Phi}{\partial x}$ correctly
+2 Checking $\{N = \frac{\partial \Phi}{\partial y}$ to find $h'(y)$
+2 $\{M = \frac{\partial \Phi}{\partial x}$ to find $h'(x)$
+1 Finding $h(x)/h(y)$ arbitrary constant of integration

d) $\Phi(x,y) = xe^y + \cos(y) = 6$ +2

Answer Key
Exam 1

#10 a) $y=0$, $y=-2$, $y=4$
 (+1) (+1) (+1)

b) $y=0$ unstable (+2)
 $y=-2$ semistable (+2)
 $y=4$ asymptotically stable (+2)

c) $y \rightarrow -2$ (+2)

d) $y \rightarrow 0$, since $y=0$ is an equilibrium solution

#11 a) $w(y_1, y_2)(t) = \begin{vmatrix} 4e^t & -2t \\ 4e^t & -2 \end{vmatrix} = -8e^t + 8te^t = \cancel{8e^t}$
 (+2) (+2)

b) True, $w(y_1, y_2) \neq 0$ (+2)

c) $y(t) = c_1 e^t + c_2 t$ General Solution (+1.5) (+1.5)

d) Particular $y(t) = 8e^t - 9t$ (+3)

e) True, $c_1 = c_2 = 0$ (+2)

f) False, no linear combo of t , e^t makes te^t . (+2)

#12 Step 1: $y_2 = t^2 v(t)$
 $y_2' = 2tv + t^2 v'$ (+3)
 $y_2'' = t^2 v'' + 4tv' + 2v$

Step 2: Plug into DE: $t^2 [t^2 v'' + 4tv' + 2v] - 4t [2tv + t^2 v'] + 6[t^2 v] = 0$ (+2)

(+2) $\rightarrow t^4 v'' = 0 \Rightarrow v(t) = c_1 t + c_2$ (+2)

Thus, $y_2(t) = v(t)t^2 = c_1 t^3 + c_2 t^2$ (+2)

General solution $y(t) = c_1 t^2 + c_2 t^3$ (+2)