

ANSWERS:

1. A

2. E

3. $(-1, 1)$

4. (a) $y = -4, 0, 2$; (b) $y = 0$ is (asymptotically) stable; (c) $\lim_{t \rightarrow \infty} y(t) = 0$.

5. (a) $\frac{\partial M}{\partial y} = 1 = \frac{\partial N}{\partial x}$; (b) $\frac{x^4}{4} + xy + \frac{5y^2}{2} = 10$.

6. (a) $y(t) = C_1 e^{2t} + C_2 e^{-t} + 3te^{-t}$; (b) $y(t) = \frac{-2}{3} e^{2t} + \frac{2}{3} e^{-t} + 3te^{-t}$.

7. (a) $\sin y + \frac{y^2}{2} = e^t + t + \sin 3 + \frac{7}{2}$; (b) $y = \frac{3 \ln t + 2}{t}$ or $y = \frac{\ln t^3 + 2}{t}$.

8. $y(t) = C_1 e^{-t} \cos \sqrt{2}t + C_2 e^{-t} \sin \sqrt{2}t$.

9. (a) Substitute y_1 and y_2 into the equation to see that they would each satisfy it.

(b) Yes. Because $W(y_1, y_2)(t) = te^t - e^t \neq 0$.

(c) $y(t) = C_1 t + C_2 e^t$.

10. $W(y_1, y_2)(t) = 4t^2$

11. (a) $Q' = 10 - \frac{1}{50}Q$, or $Q' + \frac{1}{50}Q = 10$, $Q(0) = 0$.