

MATH 251  
Exam 1  
July 9, 2007

ANSWER KEY

1. C, E, H, D, A
2. B
3. C
4. A
5. A
6. D
7. (a), (b) The 3 equilibrium solutions are:  $y = -1$  (stable),  $y = 0$  (unstable), and  $y = 2$  (stable).  
(c)  $y = 0$   
(d)  $\lim_{t \rightarrow \infty} y(t) = -1$   
(e)  $0 < \alpha < \infty$ .
8. (a)  $\frac{\partial M}{\partial y} = 12xy - \sin y = \frac{\partial N}{\partial x}$   
(b)  $3x^2y^2 + x \cos y - x^3 = -6$
9.  $y(t) = 2 + \ln t$
10.  $y(t) = C_1 e^t \cos 2t + C_2 e^t \sin 2t + t^2 + 2t - 2$ .
11. (a)  $\frac{dQ}{dt} = -\frac{Q}{20}$ , or  $\frac{dQ}{dt} + \frac{Q}{20} = 0$ ;  $Q(0) = 120$ ,  
(b)  $Q(t) = 120e^{-t/20}$   
(c)  $20 \ln(10)$