

Name _____

Class time _____

Applied Differential Equations 2250-1 and 2250-2
Sample In-Class Midterm Exam 1
Spring 2004

Exam Date: Wednesday, 11 February, 2004

Instructions. There are 4 versions: A-D, E-K, L-Q, R-Z. Choose the version based upon your last name.

The exam is in class, 50 minutes. A sample exam is supplied separately. Not allowed on the in-class exam: calculators, computers, notes and books.

3. **(Linear Equations)** Solve the linear equation $2xy'(x) + 7y(x) = \sqrt{3x}$, $y(1) = 4$. Expected details include the integrating factor method and all integration steps, by hand.
4. **(Logistic DE)** Solve the logistic problem $P' = (2 - 3P)P$, $P(0) = 100$. Graph typical solution curves, including the equilibrium solutions. In the graphic, label the spout and funnel structures and mark them as stable or unstable.
5. **(Velocity and Acceleration)**
 - (a) Solve $5v' = -100 - 50v$, $v(0) = 50$.
 - (b) Solve $y' = v(t)$, $y(0) = 10$, where $v(t)$ is the answer from (a).
 - (c) Find the limiting velocity $v_\infty = \lim_{t \rightarrow \infty} v(t)$.

Reference: This is a special case of the kinematics problem $my'' = -mg - ky'$, $y(0) = 0$, $y'(0) = v_0$.