

TEXAS A&M UNIVERSITY  
DEPARTMENT OF MATHEMATICS

MATH 308-506

Exam 1.A, 21 Sep 2005

Name:

Mark:

/40

1. Sketch the direction field for the equation

$$\frac{dx}{dt} = 5x(x-1)^2(2-x)$$

in the region  $0 \leq t \leq 1$ ,  $0 \leq x \leq 2.5$ . What is the  $t \rightarrow \infty$  limit of the solution satisfying  $x(0) = 1.5$ ? Can the solution satisfying  $x(0) = 0.5$  ever grow to 1.5? Justify.

**(8 marks)**

2. Solve the IVP

$$\frac{dx}{dt} = x^2(1 + \sin(t)), \quad x(0) = 1.$$

**(8 marks)**

3. Solve the IVP

$$\cos(x)\frac{dy}{dx} + 2\sin(x)y = x\cos^3(x), \quad y(0) = 2.$$

**(8 marks)**