Name _____ Class Time _____

Math 2250 Extra Credit Problems
Chapter 2
January 2009

Due date: See the internet due date for 4.1, which is the due date for these problems. Records are locked on that date and only corrected, never appended.

Submitted work. Please submit one stapled package per problem. Kindly label problems **Extra Credit**. Label each problem with its corresponding problem number, e.g., Xc2.1-8. You may attach this printed sheet to simplify your work.

Problem XcL1.1. (maple lab 1)

Solve the following quadratic equations using maple, as in Example 1 of maple lab 1, then use maple to reconstruct the quadratic equation from the roots. You may submit this problem only for score increases on maple lab 1.

(a) $x^2 + x + 1 = 0$
(b) $8x^2 + 2x + 15 = 0$
(c) $5x^2 - 250x + 3125$

Problem XcL1.2. (maple lab 1)

Plot the following functions in maple. Print the plots in size 2×2 inches, approximately. You may submit this problem only for score increases on maple lab 1.

(a) $f(x) = x^2 - 7x + 5$ on $-1 \le x \le 3$
(b) $f(x) = |x - 1| + |2x + 3|$ on $-5 \le x \le -1$
(c) $f(x) = e^x \sinh(x - 1) + e^{-x} \sinh(2x - 3)$ on $-2 \le x \le 1$
(d) $f(x) = \ln|\sin(2x) + \cos(3x) + 3|$ on $-2\pi \le x \le 3\pi$

Problem Xc2.1-8. (Verhulst equation)

Solve $x'(t) = 4x(t)(7 - x(t))$, $x(0) = 11$ by separation of variables and partial fractions. Sketch the solutions, including equilibria. Check your answer from the textbook answer for 2.1-7.

Problem Xc2.1-16. (population dynamics)

Assume a population $P(t)$ of alligators with $P(0) = P_0$ satisfies the Verhulst equation $P' = (aP - b)P$ with birth rate $aP_0^2 = 11$ and death rate $bP_0 = 12$ [see 2.1-18 in the textbook]. Find the equilibrium solutions, sketch them and a suitable sampling of other possible solutions. Determine the time t at which $P(t) = M/10$, where $M = b/a$ is the threshold population.

Problem Xc2.2-10. (Separation of variables, Verhulst DE)

Solve $x'(t) = x(t)(3 - x(t))$ by separation of variables and partial fractions. Sketch the solutions, including equilibria. Check your answer from the textbook answer for 2.2-4.

Problem Xc2.3-10. (Parachute)

Assume model (1) $v' = -32 - 0.15v$ before the chute opens and model (2) $v' = -32 - 1.5v$ after. Suppose the fall from 10000 feet uses (1) for 15 seconds. Find the trip time from 10000 feet to the ground (0 feet).

Problem Xc2.3-20. (Terminal speed)

Assume model $v' = -32 + 0.075v^2$ for a parachutist who pulls the ripcord at 10000 feet at speed 10 feet per second. Find his terminal speed and the trip time to the ground from 10000 feet.

End of extra credit problems chapter 2.