

Name \_\_\_\_\_  
Student I.D. \_\_\_\_\_

**Math 2250-4**  
**Quiz 3**  
**January 27, 2012**

1) Consider the following differential equation for a function  $x(t)$ , which could be modeling a logistic population with harvesting:

$$x'(t) = -2(x - 3)(x - 1).$$

1a) Draw a phase diagram. Identify the equilibrium solutions and whether or not they are stable.

(3 points)

1b) Solve the initial value problem for the differential equation above, with  $x(0) = 4$ :

$$x'(t) = -2(x - 3)(x - 1)$$

$$x(0) = 4.$$

Hint: To save time with partial fractions use the identity

$$\frac{1}{(x - a)(x - b)} = \frac{1}{a - b} \left( \frac{1}{x - a} - \frac{1}{x - b} \right).$$

(6 points)

1c) For your solution  $x(t)$  to (b), does  $\lim_{t \rightarrow \infty} x(t)$  agree with the value implied by your phase diagram in part (a)?

(1 point)