

Name _____
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Math 2250-1
Quiz 3
September 7, 2012

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

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

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 $x(0) = 0$:

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

$$x(0) = 0.$$

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), verify that $\lim_{t \rightarrow \infty} x(t)$ does agree with the value implied by your phase diagram in part (a).

(1 point)