HW 6

p. 48 4 (a, b, c), 6 (a, b), 7 (a, b, c, d) 7 + 10

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(4) b. This is the classic predator-prey (discrete) model with an equilibrium at $(M_e, O_e) = (150, 200)$. This equilibrium is an unstable spiral. Whenever the mouse population is below 150, the owl population decreases (reverse holds so that mice above 150 results in increasing owl population. Similarly, whenever the owl population is below (above) 200, the mouse population increases (decreases). The unstable spiral implies increasing oscillations until one population goes extinct. If mice first go extinct, owls follow; while if owls go extinct the mouse population would be unbounded. (Model fails when one population becomes negative and this always happens.)

(7) a. k_1 represents Malthusian growth of the prey species, the scale insect

k_2 represents loss of prey species by interaction (contact) with the predator

k_3 represents loss of the predator in the absence of prey

k_4 represents gain of the predator (reproduction) by consuming prey through contact.