11. (9 points) Recall Hanky- and Pankytowns? On the first exam, we saw that the population of Pankytown, in thousands, could be modeled by

$$P(t) = 50(0.8)^t$$

where t is the number of months after February, 2001 when valentines were banned in Pankytown.

(a) At what rate was the population of Pankytown changing in May of 2001?

$P'(t) = 50(\ln(0.8))(0.8)^t$

$P'(3) = 50(\ln(0.8))(0.8)^3$

≈ -5.712

The population is decreasing at approx 5712 people per month.

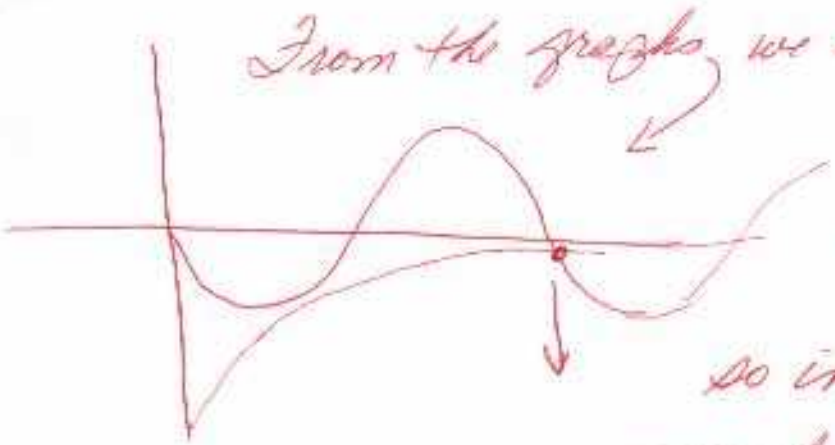
(b) We also found in Exam 1 that the population of Hankytown (in thousands) was given by

$$H(t) = 9\cos\left(\frac{\pi t}{6}\right) + 11$$

with $t = 0$ representing the month of February, 2001. Is there a time (or times) during the first 18 months after February, 2001, that the models indicate that the populations of Pankytown and Hankytown are changing at the same rate? If so, when? If not, explain why not. Clearly explain how you found your answer.

$H'(t) = \frac{-3\pi}{2}\sin\left(\frac{\pi t}{6}\right)$

From the graphs, we see



The rates are the same @ $t \approx 12.3$, so in Feb 2002 the populations are changing at the same rate

Also, for $t \approx 19.9$ so again in July, 2002