

MATH 111A - Autumn 2001
EXAM I-Version 1

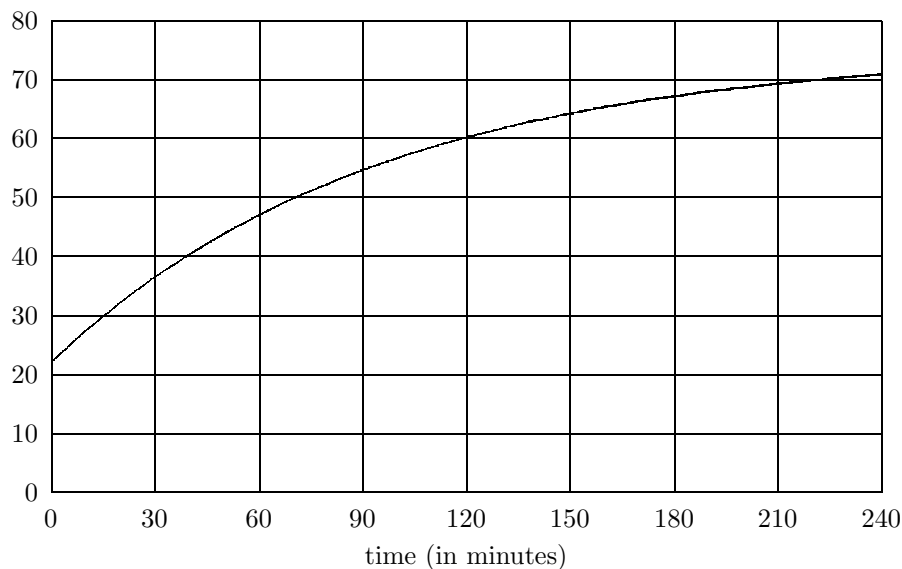
Name _____

Section _____

Put all answers on the **ANSWER SHEET** provided, but show all necessary work on the **EXAM** (using the back of the pages, if necessary).

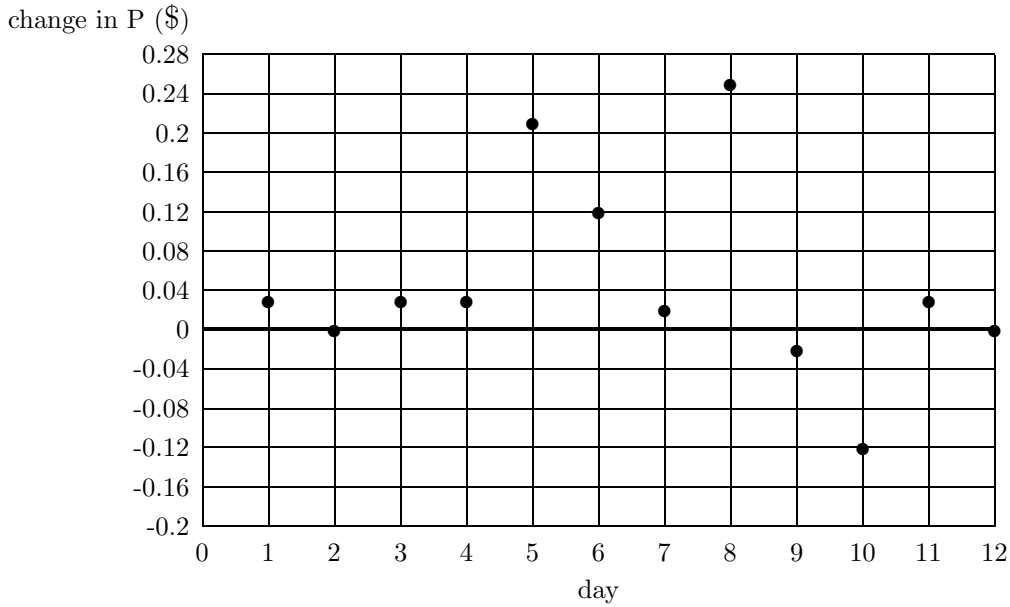
1. (16 points) A can of frozen orange juice concentrate has temperature 23° F in the freezer. At noon, you take the juice out to thaw, setting it on the counter in a room where the temperature is 75° F. The graph below shows the temperature, $J(t)$, of the juice at time t , measured in minutes after noon.

temperature (in $^\circ$ F)



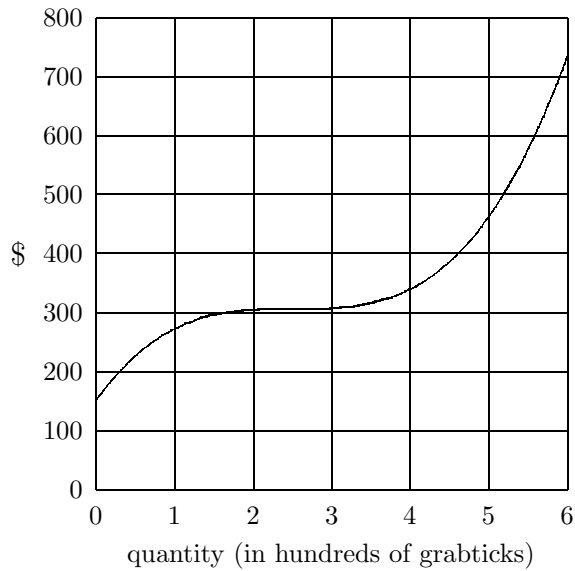
- (a) What is the overall rate of change of temperature at 2:00 p.m.?
- (b) What is the incremental rate of change of temperature from 1:30 p.m. to 3:30 p.m.?
- (c) Which of the following statements is true?
- i. The overall rate of change of temperature is always increasing.
 - ii. The overall rate of change of temperature is always decreasing.
 - iii. The overall rate of change of temperature decreases for a while and then increases.
 - iv. The overall rate of change of temperature increases for a while and then decreases.
- (d) Translate the following into English, incorporating the phrase *rate of change* at least once:
- $$\frac{J(90) - 23}{90} > \frac{J(90) - J(60)}{30}.$$
- (e) Name a 30-minute time interval over which the incremental rate of change of temperature is less than $.33^\circ$ per minute.

2. (10 points) The opening price of a stock is monitored over several days. This gives a function $P(t)$, the price of the stock on day t , starting at day $t = 0$. The graph below gives the *change* in price over the *previous* day. For example, from day 0 to day 1, the price of the stock increased by \$0.03.



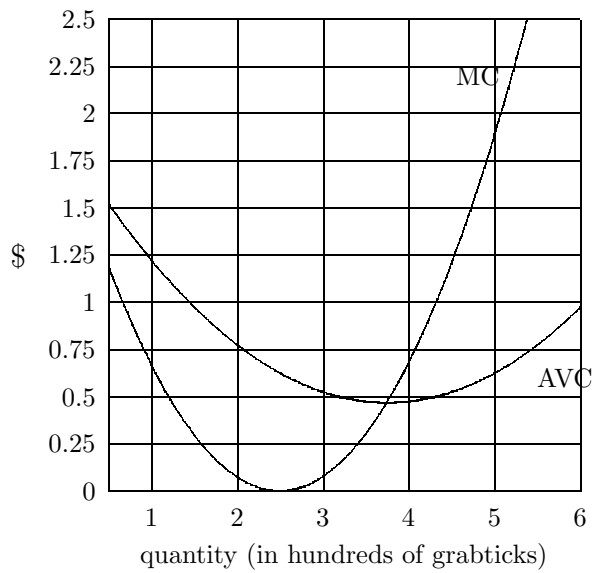
- (a) Suppose the price of the stock was \$5.35 on day 9. What was the opening price on day 8? on day 11?
- (b) Name a day on which the price was the same as the day before.
- (c) Was the price higher on day 5 or day 6? Explain your answer.

3. (24 points) You produce and sell grabticks in various quantities. At any given time, there is a market price $\$p$ at which all grabticks are sold. Use the following graph of total cost (TC) versus quantity to answer questions a-e.



- What is the total cost of producing 250 grabticks?
- What is the fixed cost?
- What is the variable cost of producing 500 grabticks?
- What is the breakeven price?
- How many grabticks are produced when the marginal cost is equal to the average total cost?

Use the following graph of marginal cost (MC) versus quantity and average variable cost (AVC) versus quantity to answer questions (f)-(h).



- (f) What is the average variable cost of producing 300 grabticks?
- (g) What is the smallest value of AVC?
- (h) What is the shutdown price?