

Homework 1

Due Friday, June 24

Worksheet 1: Do each of the problems (1–15).

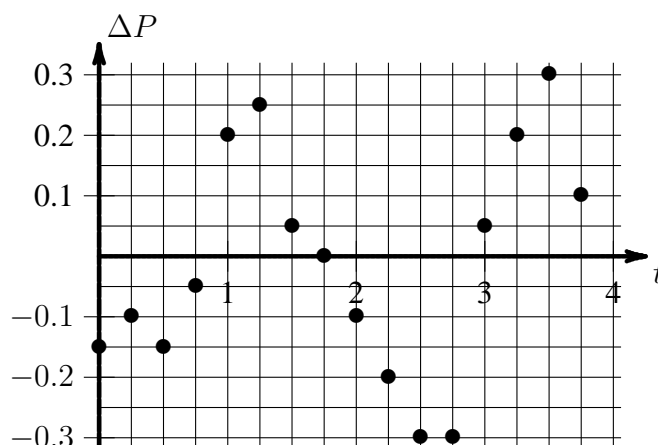
Worksheet 2: Do 1–7 in the textbook, and then the following questions.

Note: These questions are almost the same as the arrowed questions in the textbook, with slight changes. They don't have answers, but you can look at the corresponding problems in the book (which do have answers) for help.

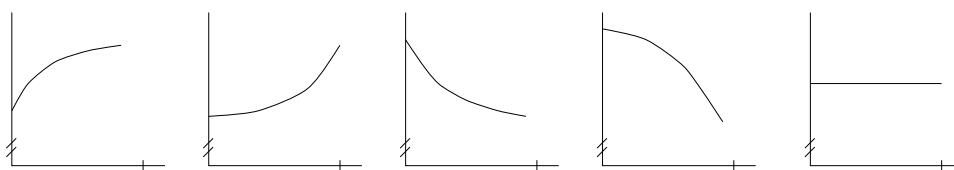
Come by office hours if you have any questions! Office hours this week are:

Wednesday 4:30–6, Thursday 4:30–6.

- 8 Barometric pressure (in inches) is monitored over several days. The graph to the right depicts the *CHANGES* in barometric pressure over 1/4-day intervals. Each of the data points was placed at the beginning of the time interval. For example, the point at $t = 1$ represents the change in pressure (ΔP) from $t = 1$ to $t = 1.25$. Time $t = 0$ corresponds to Midnight, January 9, 1980. At $t = 0$, the barometric pressure measures 27 inches.

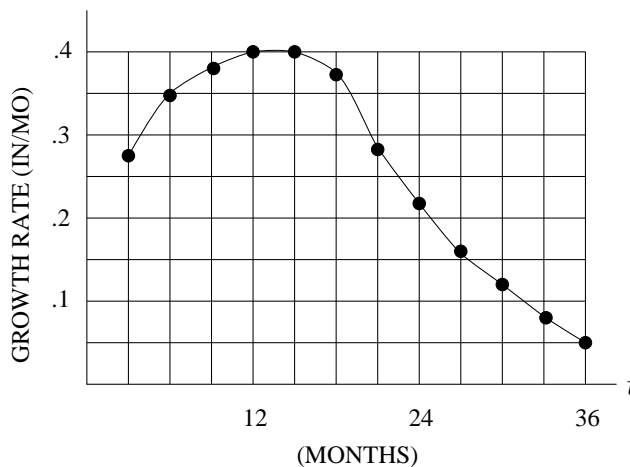


- Name all the periods of time over which the graph of pressure is increasing.
- Which of the following most closely resembles the graph of pressure from $t = 3.0$ to $t = 3.5$?



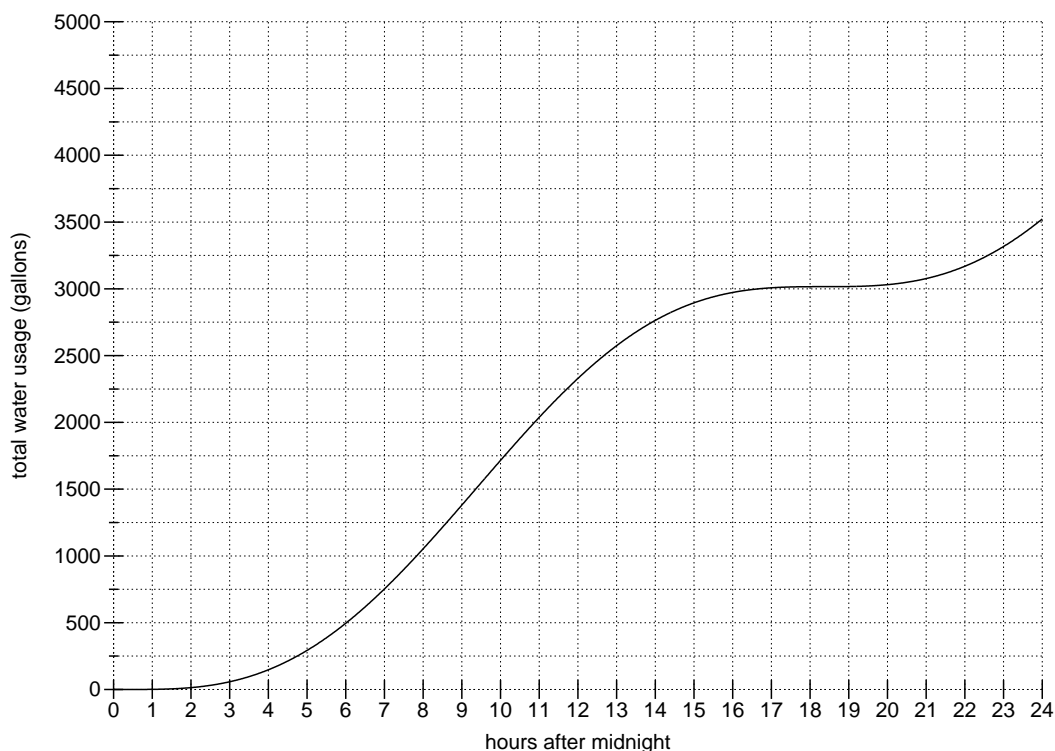
- For each of the following pairs of times, pick the time when the pressure is higher:
 - $t = 1.25$ or $t = 1.75$
 - $t = 0$ or $t = 0.5$
 - $t = 2.75$ or $t = 3.25$.
- Weather is often at its worst when the pressure is falling rapidly. When, during the 4-day period pictured above would you have expected the worst weather?
- What is the change in pressure on January 9 (from $t = 0$ to $t = 1$)?
- What was the change in barometric pressure on January 12?

→ 9 Starting on his 12th birthday, Juan's parents measure his height every 3 months. However, rather than record his height, they record his incremental rate of change over the preceding 3 months. That is, they subtract to find out how much he has grown in the 3 months, and then they divide by 3 to get a monthly growth rate. The graph to the right gives their record of Juan's monthly growth rate at 3-month intervals.



- a) How many inches did Juan grow in the three months preceding his 14th birthday?
- b) Assume that Juan was 66 inches tall on his 14th birthday. How tall was he 6 months earlier?
- c) When did Juan grow more: in the six months after his 12th birthday, or in the six months after his 13th birthday?
- d) There are two 3-month intervals when Juan's growth rate is approximately 0.375 inches per month. Which of the following statements is true of these two intervals?
 - (i) He is growing faster over the one interval than the other.
 - (ii) He is shorter over the one interval than the other.
 - (iii) One interval is before he reaches his peak height and the other is after.
 - (iv) None.
- e) To calculate Juan's lifetime growth rate at any particular time, his parents divide his height at that time by the number of months he has been alive. Again, under the assumption that Juan is 66 inches tall on his 14th birthday, tell what Juan's lifetime growth rate (in/mo) was 6 months after his 13th birthday.

- 10 A town is using water from a reservoir that is being refilled with a system of aquaducts. The graph below shows the total water drawn from the reservoir over the course of a day, starting at midnight.



- (a) Name a time when the overall average rate of water usage was 100 gallons per hour.
- (b) Suppose the reservoir was empty at midnight and was being filled by the aquaduct at a constant rate. How small could that rate be and still provide enough water for the town during this 24 hour period?
- (c) Now, suppose that the reservoir instead had 2000 gallons at midnight and was being filled by the aquaduct at a constant rate. How small could that rate be and still provide enough water for the town during this 24 hour period?
- (d) Suppose the aquaduct was filling the reservoir at a constant rate of 125 gallons per hour. How much water would there have to be in the reservoir at midnight for the town to get all the water it needed?