Homework 3

Worksheet 6: Do each of the problems (1–8).
**Worksheet 7**: Do problems 1–7, and the versions of 8–11 below.
~~**Worksheet 8**: Do all problems in the book (1–15).~~ *We didn't get to Worksheet 8 in time, so this will be part of homework #4.*

Have questions? Drop in at office hours Tuesday through Thursday (see website for the info), or get last-minute help during Thursday's Q & A.

Hint: The arrowed questions on this assignment all involve graphs. So your first (and probably hardest) task in each question is to convert each question to a question about graphs.

Worksheet #7

$\rightarrow$ $\boxed{8}$ Below are the graphs of weight in pounds of two puppies, A and B (from the same litter) for a period of 72 hours after their birth. We denote the weight of the two puppies at time t by $A(t)$ and $B(t)$, respectively.
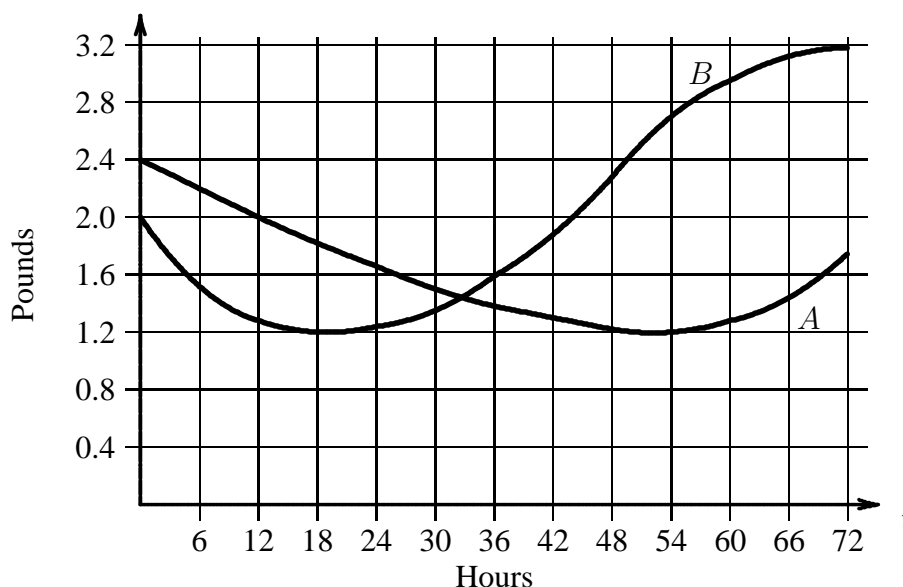
a) What is the difference in the weights of the two puppies at 6 hours?

b) Name a 6-hour time interval over which B has gained 0.2 pounds. (Use one of our graph methods, rather than guessing and checking.)

c) Find a time when B's overall average weight gain is 0.01 lbs/hour.

   (*Note:* Since B's initial weight is not zero, the graph of $B(t)$ does not go through the origin. Graphically, this means that the line you use to measure overall rate of change is no longer a diagonal line. Instead, it goes through the y-intercept of B.)

d) How quickly is A's weight changing during the 6-hour time period starting at $t = 24$? (In other words, what is the average rate of change during this time?)

e) What is the greatest difference in the two puppies' weights over the 72 hours?

1

f) Suppose a third puppy, Puppy C is born in the same litter and always weighed exactly half of B's weight. How much weight did Puppy C lose over the first 24 hours?

→ 9 The graph to the right shows the price per share (in dollars) of the common stock of Technigraphics (TG) over a 12-month period.
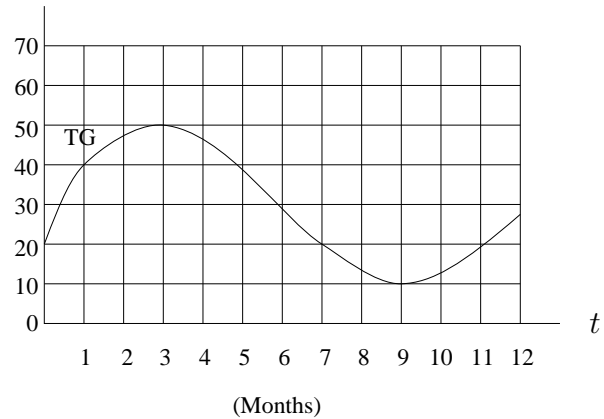
a) Suppose another stock, Sure-Thing Inc. (ST) starts at $10 per share and increases its price every month by $2. On the axes to the right draw the graph of the price of ST for the 12-month period.

(Months)

b) Give a time when the incremental rates of change of the two stocks from that time to one month later are the same.

c) Let $f(t)$ be the abbreviation for the price of TG at time t. Find the value of $\dfrac{f(9) - f(0)}{9}$.

d) Name a 2-month time interval, <u>if any exists</u>, where $\dfrac{f(t + 0.1) - f(t)}{0.1}$ changes from negative to positive.

  Clue: $\frac{f(t+0.1)-f(t)}{0.1}$ is the average rate of change over the (small) time interval from t to $t + 0.1$.

e) Find a 2-month period over which the price of TG increases by $5.

f) Which stock has the larger change in price from the beginning of the period to the time $t = 7$ months?

→ 10 The graph to the right shows the amount of water that has flowed <u>into</u> a reservoir by various times over a 12-hour interval starting at midnight. We abbreviate this amount by $I(t)$.
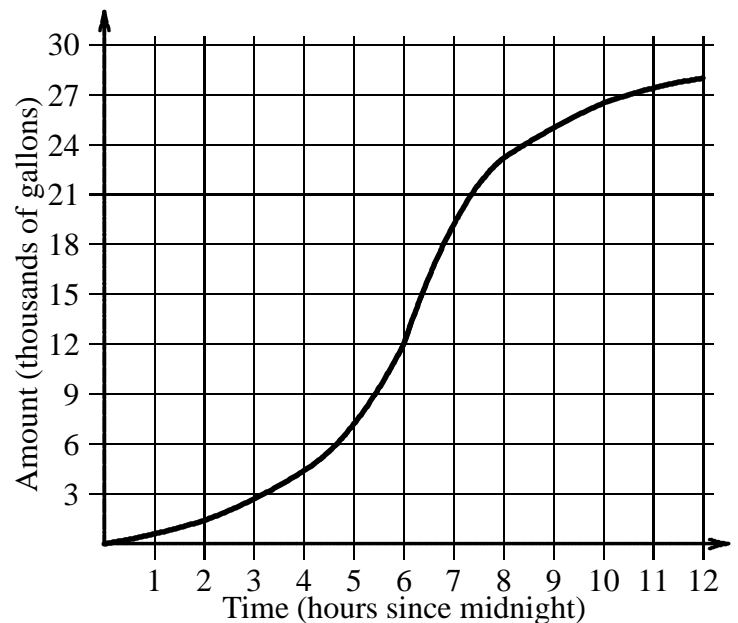
a) Water flows out at a constant rate of 2,500 gallons per hour. On the axes to the right draw the graph of Water Out *vs.* time.

b) What is the smallest amount of water we can start with to make sure there is always water available in the reservoir?

2

c) At what time t is $\frac{I(t)}{t}$ the greatest? (Key: $\frac{I(t)}{t}$ is an overall rate of change. It's the overall average rate of water flowing in.)

d) Suppose the reservoir has 9,000 gallons of water in it at midnight. Find another time when it has 9,000 gallons of water in it.

e) Let $g = I(t)$ and $\Delta g = I(t+1) - I(t)$. Find two times at which $\Delta g = 1,000$.

f) Is the water level rising from $t = 4$ to $t = 6$ hours? Why or why not?

g) Find a time t when $\dfrac{I(t + 0.25) - I(t)}{0.25} > \dfrac{I(t)}{t}$.

   (Hint: This inequality has two pieces: $\frac{I(t+0.25)-I(t)}{0.25}$ and $\frac{I(t)}{t}$. What does each piece mean?)

$\rightarrow$ ⬚11 The graphs of $f(x)$ and $g(x)$ are given below.
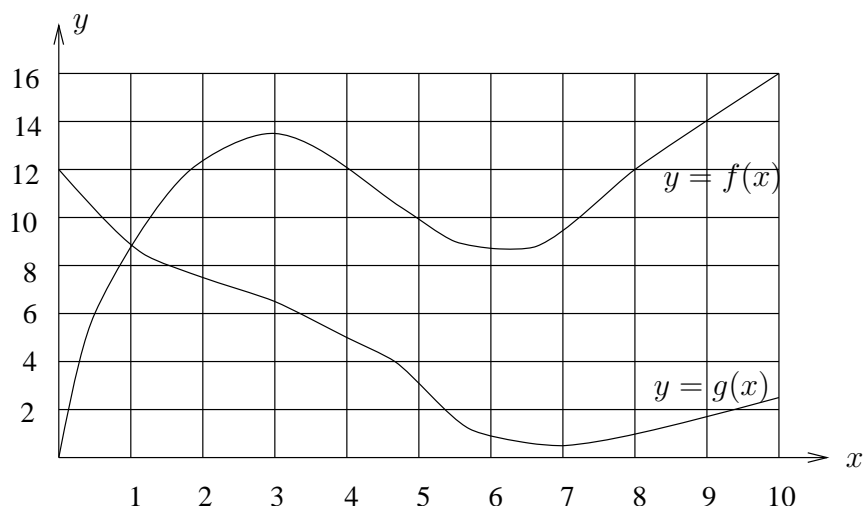
For each of the following statements find the value of x that makes the equation true. (Use an appropriate graphical method from class. Guess-and-check is not allowed!)

a) $\dfrac{f(x + 0.5) - f(x)}{0.5} = 0$

b) $\dfrac{f(x + 4) - f(x)}{4} = 1$

c) $g(x + 1) - g(x) = 2$