

Midterm #1 — September 26, 2011, 8:30 to 10:00 PM

Name: _____

Circle your recitation:

R02 (Chira, Mon)

R03 (Chira, Wed)

R04 (Marcelo, Tue)

- **You have a maximum of $1\frac{1}{2}$ hours.** This is a closed-book, closed-notes exam. No calculators or other electronic aids are allowed.
- Read each question carefully. Show your work and justify your answers for full credit. You do not need to simplify your answers unless instructed to do so.
- If you need extra room, use the back sides of each page. If you must use extra paper, make sure to write your name on it and attach it to this exam. Do not unstaple or detach pages from this exam.

Grading

1	/15
2	/18
3	/16
4	/12
5	/15
6	/14
7	/10
Total	/100

1. (15 points) Below is the graph of a linear function $L(x)$.



(a) Estimate $L(1)$ and $L(6)$.

(b) What is the slope of the line?

(c) Write a formula for $L(x)$.

2. (18 points) After t years, a savings account has a dollar value given by

$$V(t) = 20,000(1.2)^t.$$

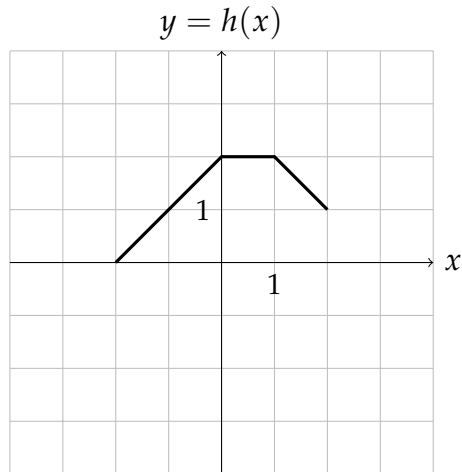
(a) What is the initial value of the investment?

(b) What is the growth rate, as a percentage?

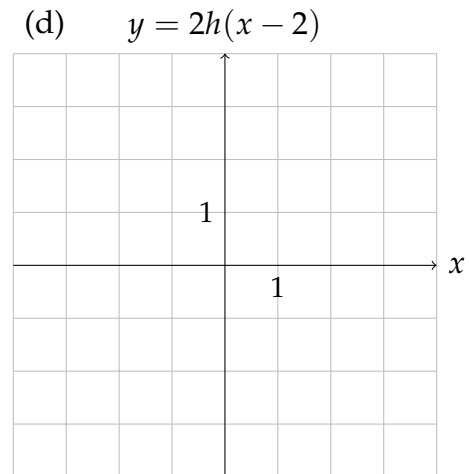
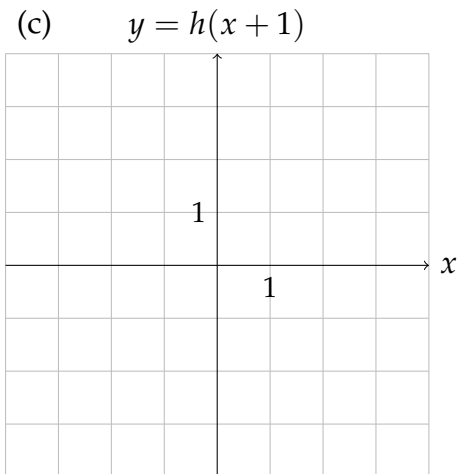
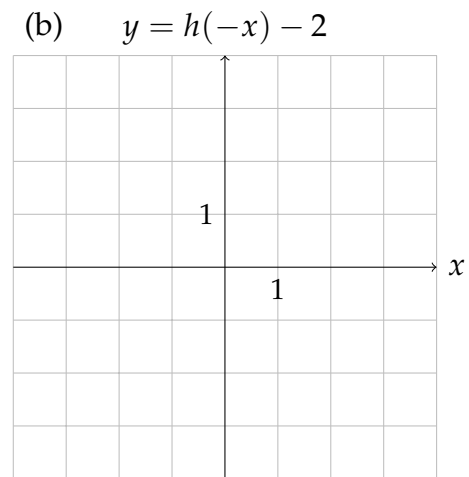
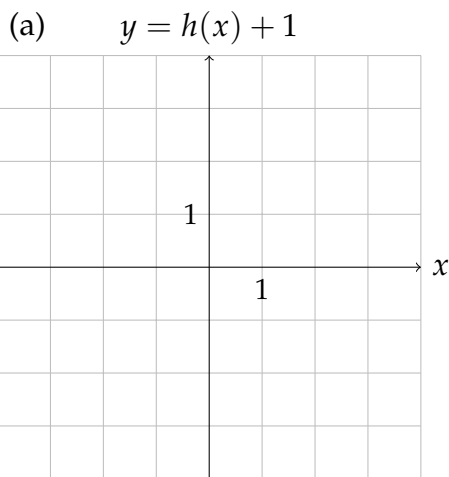
(c) What is the value of the investment after 2 years?

(d) At what time t would the investment reach \$60,000? (You do not need to give a numerical answer, but it should be something you could enter into a calculator to get one.)

3. (16 points) Below is the graph of a function $h(x)$.



Sketch graphs of the following functions on the axes provided:



4. (12 points) After the 2010 census, the city of Greenpoint has a population of 19,000, and the nearby city of Darbyville has a population of 87,000.

(a) Suppose Greenpoint grows at an *annual* rate of 4%. Write a formula for its population t years after 2010.

(b) Darbyville instead loses population at a *continuous* rate of 8% per year. Write a formula for its population t years after 2010.

5. (15 points) Define the functions $f(x) = x^2 - 3$ and $g(x) = 3x + 1$. Find formulas for

(a) $f(g(x))$

(b) $g(f(x))$

(c) $f(f(x))$

6. (14 points) We are tracking the location of a railroad car traveling along a track from Santa Fe to Houston by measuring its distance along the track from Santa Fe.

Time	1 pm	2 pm	3 pm	4 pm	5 pm
Position (miles)	380	438	492	546	592

(a) What is the average velocity of the car between 1 pm and 2 pm? Include units.

(b) What is the average velocity of the car between 3 pm and 5 pm? Include units.

(c) Could the position of the car be a linear function of time? Explain your answer.

7. (10 points) We are buying steel for a new building. Acme Steel offers steel at \$900 per ton and will charge us an extra \$1000 to deliver our order. Bethlehem Steel sells steel for only \$800 a ton but charges an extra \$3000 to deliver it, as they are located farther away.

(a) Write functions $A(x)$ and $B(x)$ that give the cost of buying x tons of steel from Acme and from Bethlehem, respectively.

(b) Under what circumstances should you buy steel from Acme? From Bethlehem? Explain your decision.