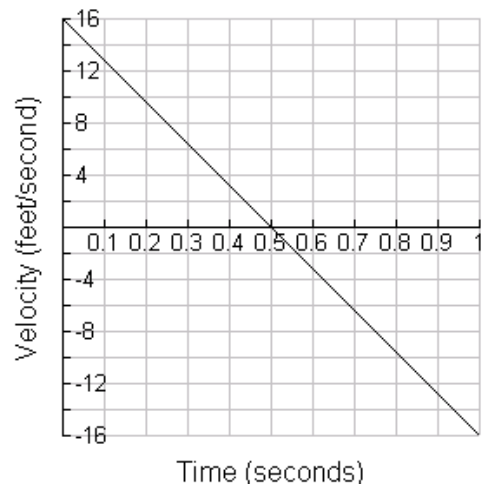


Math 80 – Spring 2009  
Practice Problems for Chapters 2 & 3

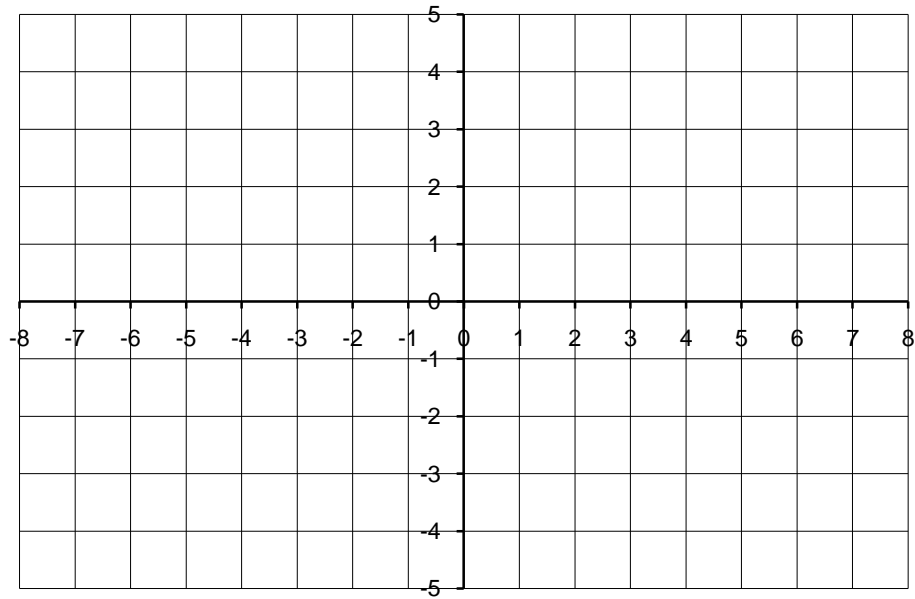
1. If you take Physics 5 at Cerritos (or any other introductory physics class for that matter), you will study Galileo and his interesting experiments that showed that velocity of a falling object accelerates at a constant rate according to the equation  $v = v_0 + at$ , where  $v$  is the velocity of the object at time  $t$ ,  $v_0$  is the initial velocity, and  $a$  is the acceleration due to gravity. The graph below shows what happens to the velocity as the ball that is thrown straight up into the air. When the ball rises the velocity is positive; when it falls, the velocity is negative.

- a. Interpret the meaning of the point (0.2, 9.6).
- b. Interpret the meaning of the point (0.8, -9.6).
- c. Find an equation that models this graph. Don't forget to define your variables!



- d. Based on this graph, what is the acceleration due to gravity? Why do you think it is negative?
- e. What is the meaning of the y-intercept?
- f. Mark the point on the graph that represents the ball when it has reached its peak, right before it begins to fall. Explain how you chose your point.

2. (a) Graph the equation  $3x - 2y = 4$ . Show what you did to make your graph.



(a) What is the slope of your graph?

(b) Graph a line parallel to the line you drew in (a) that passes through  $(-4, 1)$ . Write the equation of this line.

(c) Graph a line perpendicular to the line you drew in (a) that passes through the point  $(4, 2)$ . Write the equation of this line. Show work.

3. Jenny's doctor gives her a 500-mg injection of an antibiotic. The amount of antibiotic in Jenny's bloodstream will begin to decrease as her body begins to rid itself of 12% of the antibiotic each hour.
- Write the number of milligrams of the antibiotic that are in Jenny's bloodstream for the first five hours after the antibiotic was administered.
  - Does this data generate an arithmetic sequence, a geometric sequence or neither? Explain.
  - How would you compute the amount of antibiotic left in Jenny's bloodstream recursively?
  - Write a *function* that gives the amount of antibiotic left in Jenny's bloodstream after  $t$  hours.
  - After one day how much of the antibiotic will be left in Jenny's blood stream? Explain what you did to get your answer.
4. Let  $N$  be the number of pets boarded at a kennel for each year since 2000. If  $t$  is measured in years since 2000, the model  $N(t) = 0.2t^2 + 20t + 500$  approximates the number of pets boarded each year since 2000.
- What is the vertical intercept? What does it represent in the problem situation?
  - Find  $N(10)$ . Write a complete sentence interpreting your answer.
  - Calculate  $\frac{\Delta N}{\Delta t}$  as  $t$  increases from 2 to 4. Write a complete sentence interpreting your results.
  - In what year will this kennel be boarding approximately 200 pets?

5. For a certain function *Beauty*, each increase of four units in the input causes the output to decrease by 5 units. Also  $Beauty(4) = 10$ .
- What is the rate of change for the linear function *Beauty*?
  - What happens to the output if the input increases by 8 units?
  - What happens to the input if the output increases by 5 units?
  - Find  $Beauty(0)$ . Show how you got your answer.
  - Find  $Beauty(5)$ . Show how you got your answer.

6. The following table represents the total fees for a non-resident student at Cerritos College in terms of the number of units taken..

- Find the rate of change when the number of units changes from 4 units to 9 units. Write a sentence interpreting your answer.

Number of units	Total Fees (\$)
1	197
2	370
3	543
4	716
9	1581
10	1754
11	1927

- Total fees are a function of the number of units taken. Is this function linear, exponential or neither? Explain.

- Write a function with the number of units as input and the total fees as output.
- What is the vertical intercept and what does it represent in this situation?
- Use your function to determine the total fees for 20 units.

7. Write general formulas for the following sequences.

- (a) The first element is 4 and each element is 2.5 times the preceding element.
- (b) The first element is 4 and each element is 2.5 more than the preceding element.
- (c) The first five elements are 1000, 100, 10, 1, 0.1.
- (d) The first five elements are 13, 13, 13, 13, 13.
- (e) The first five elements are 780, 620, 460, 300, 140.

8. Write an example of

- (a) a decreasing linear function with a vertical intercept at (0, 6).
- (b) a decreasing exponential function with a vertical intercept at (0, 6).
- (c) an increasing exponential function that passes through the point (1, 4).
- (d) a constant function that passes through the point (1, 4).
- (e) a linear function that passes through the points (3, 100) and (4, 120).
- (f) an exponential function that passes through the points (3, 100) and (4, 120).
- (g) How can you tell from the equation of a linear function that it will be decreasing?
- (h) How can you tell from the equation of an exponential function that it will be decreasing?

9. The table gives the population of two hypothetical towns in terms of years from 2000.

Years from 2000	0	1	2	3	4	5
Population of Town A	20000	21600	23200	24800	26400	28000
Population of Town B	20000	21400	22898	24501	26216	28051

(e) Are the towns experiencing linear or exponential growth? Support your answer.

(f) Find the algebraic model for each town's growth. (As always, define your variables.)

(g) Explain in words what the models tell you about each town's growth. Be as specific as possible.

(h) Is there a time after the year 2000 when these two towns will once again have the same population? How do you know?

(i) Initially, which town is growing the fastest? Does this trend continue? Why does this make sense?

10. Match each equation below with an appropriate graph. (No Calculator!) Explain why you made each choice. If no graph matches state *none* and explain why.

(a)  $y = 50(0.02)^x$

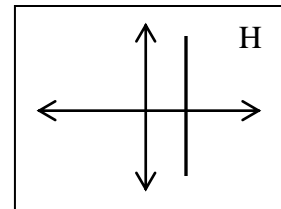
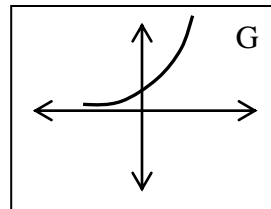
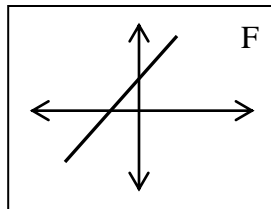
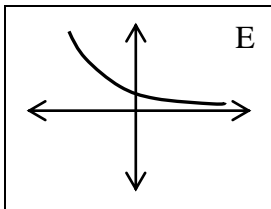
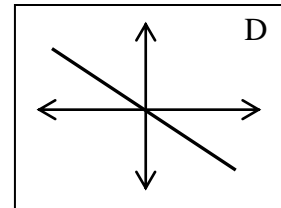
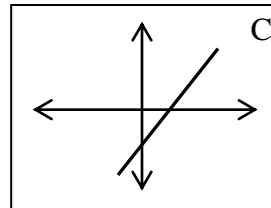
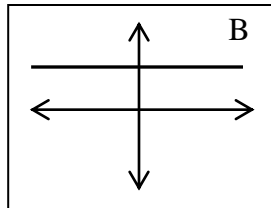
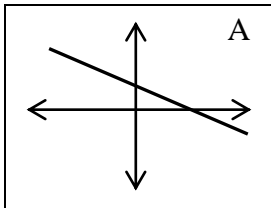
(b)  $y = 50 + 0.02x$

(c)  $y = 0.02x - 50$

(d)  $y = 50$

(e)  $y = 50 \cdot 1.02^x$

(f)  $y = -50x$



11. Skill problems

- (a) Simplify each of the following expressions involving repeated addition or repeated multiplication.

$$4x + x + x = \dots\dots\dots \quad 4x \cdot x \cdot x = \dots\dots\dots$$

$$3x^2 + 3x^2 + 3x^2 + 3x^2 = \dots\dots \quad 3x^2 \cdot 4 = \dots\dots\dots$$

$$x^4 \cdot x^4 = \dots\dots \quad x^4 + x^4 = \dots\dots \quad x^4 \cdot 4 = \dots\dots\dots$$

- (b) Write each of the following expressions as simplified fractions.

$$2^{-1} = \dots\dots\dots \quad 2^{-2} = \dots\dots\dots \quad 2^{-3} = \dots\dots\dots \quad 2^{-n} = \dots\dots\dots$$

$$3 \cdot 2^{-1} = \dots\dots \quad 3 \cdot 2^{-2} = \dots\dots\dots \quad 3 \cdot 2^{-3} = \dots\dots\dots \quad 3 \cdot 2^{-n} = \dots\dots\dots$$

- (c) Simplify each of the following expressions. Express without negative exponents.

$$2x^{-2} = \dots\dots\dots \quad 2x^{-2} = \dots\dots\dots \quad \frac{1}{x^{-2}} = \dots\dots\dots$$

$$x^{-1} \cdot x^{-1} = \dots\dots\dots \quad x^{-1} + x^{-1} = \dots\dots\dots \quad x^{-1} \cdot^{-1} = \dots\dots\dots$$

$$\frac{x}{x^{-1}} = \dots\dots\dots \quad x \cdot x^{-1} = \dots\dots\dots \quad \frac{x^{-2}}{x^{-1}} = \dots\dots\dots$$

- (d) Determine which of the following expressions are equivalent. Justify your answer.

i.  $9 - 3 - x$  vs.  $-9x + 27$

ii.  $9 - 5x + 3$  vs.  $4x + 3$

iii.  $8 \cdot 2^{x-1}$  vs.  $4 \cdot 2^x$

iv.  $f - x$  vs.  $-f(x)$  if  $f(x) = x^3 - x$

v.  $g - x$  vs.  $-g(x)$  if  $g(x) = 2x + 5$

vi.  $h(2x)$  vs.  $2h(x)$  if  $h(x) = \frac{1}{x}$

12. **True or False.** Be able to justify your answer. If it is false how can you change it to make it true?

- (a) .....  $\Delta y$  represents a rate of change.
- (b) ..... If  $f(x) = ax + b$ , then  $\frac{f(x_2) - f(x_1)}{x_2 - x_1} = a$ .
- (c) ..... The domain of a sequence is the set of integers.
- (d) ..... A geometric sequence is an example of an exponential function.
- (e) .....  $\frac{y}{x}$  represents the finite ratio of consecutive outputs.
- (f) ..... If  $y = a \cdot b^x$  is a decreasing function, then  $b < 0$ .
- (g) ..... If  $y = ax + b$  is an increasing function, then  $a > 0$ .
- (h) ..... The  $x$ -intercept of the function  $y = ax + b$  is  $(b, 0)$ .
- (i) ..... The vertical intercept of the function  $y = a \cdot b^x$  is  $(0, a)$ .
- (j) ..... The range of an exponential function is the set of all positive real numbers.
- (k) ..... The domain of a linear function is the set of real numbers.
- (l) ..... The parameters of  $y = a \cdot b^x$  are  $x$  and  $y$ .
- (m) ..... A line perpendicular to the line  $y = ax + b$  has a slope of  $1/a$ .
- (n) ..... The sequence 1, 3, 6, 10, 15... is an arithmetic sequence.
- (o) ..... The slope of the line whose equation is  $4x - 5y = 10$  is 4.
- (p) .....  $-5/78$  is an example of an irrational number.
- (q) ..... Every natural number is an integer.
- (r) .....  $-a$  represents a negative number.
- (s) ..... If  $x < 0$  and  $y > 0$ , then  $xy > 0$ .