

CHAPTER 4 – LINEAR AND QUADRATIC FUNCTIONS

Exercise 1.

In Problems 1–6:

- Determine the slope and y-intercept of each linear function.
- Find the average rate of change of each function.
- Graph each function. Label the intercepts.
- Determine whether the function is increasing, decreasing, or constant.

1. $f(x) = 2x - 5$

2. $g(x) = -4x + 7$

3. $h(x) = \frac{4}{5}x - 6$

4. $F(x) = -\frac{1}{3}x + 1$

5. $G(x) = 4$

6. $H(x) = -3$

Exercise 2.

In Problems 7 and 8, determine whether the function is linear or nonlinear. If the function is linear, state its slope.

7.

x	$y = f(x)$
-1	-2
0	3
1	8
2	13
3	18

8.

x	$y = g(x)$
-1	-3
0	4
1	7
2	6
3	1

Exercise 3.

In Problems 9–14, graph each quadratic function using transformations (shifting, compressing, stretching, and/or reflecting).

9. $f(x) = (x - 2)^2 + 2$

10. $f(x) = (x + 1)^2 - 4$

11. $f(x) = -(x - 4)^2$

12. $f(x) = (x - 1)^2 - 3$

13. $f(x) = 2(x + 1)^2 + 4$

14. $f(x) = -3(x + 2)^2 + 1$

Exercise 4.

In Problems 15–24, (a) graph each quadratic function by determining whether its graph opens up or down and by finding its vertex, axis of symmetry, y-intercept, and x-intercepts, if any. (b) Determine the domain and the range of the function. (c) Determine where the function is increasing and where it is decreasing.

19. $f(x) = -4x^2 + 4x$

20. $f(x) = 9x^2 - 6x + 3$

21. $f(x) = \frac{9}{2}x^2 + 3x + 1$

22. $f(x) = -x^2 + x + \frac{1}{2}$

23. $f(x) = 3x^2 + 4x - 1$

24. $f(x) = -2x^2 - x + 4$

Exercise 5.

In Problems 25–30, determine whether the given quadratic function has a maximum value or a minimum value, and then find the value.

25. $f(x) = 3x^2 - 6x + 4$

26. $f(x) = 2x^2 + 8x + 5$

27. $f(x) = -x^2 + 8x - 4$

28. $f(x) = -x^2 - 10x - 3$

29. $f(x) = -3x^2 + 12x + 4$

30. $f(x) = -2x^2 + 4$

Exercise 6.

In problems 31–34, solve each quadratic inequality

31. $x^2 + 6x - 16 < 0$

32. $3x^2 - 2x - 1 \geq 0$

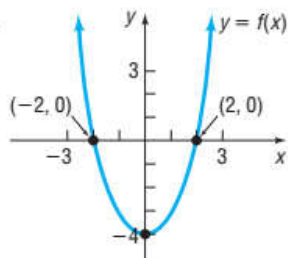
33. $3x^2 \geq 14x + 5$

34. $4x^2 < 13x - 3$

Exercise 7.

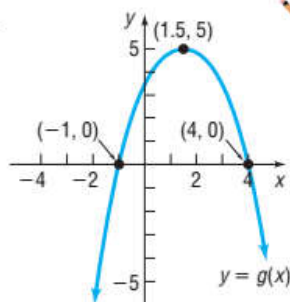
In Problems 3–6, use the figure to solve each inequality

3.



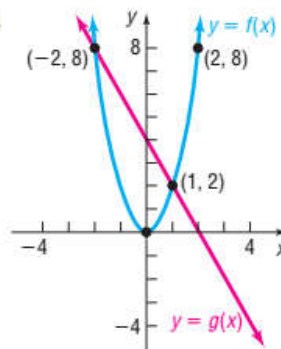
- (a) $f(x) > 0$
 (b) $f(x) \leq 0$

4.



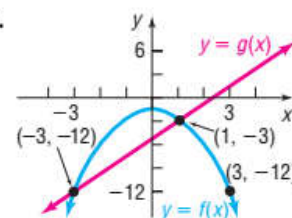
- (a) $g(x) < 0$
 (b) $g(x) \geq 0$

5.



- (a) $g(x) \geq f(x)$
 (b) $f(x) > g(x)$

6.



- (a) $f(x) < g(x)$
 (b) $f(x) \geq g(x)$

Exercise 8.

In Problems 35 and 36, find the quadratic function for which:

35. Vertex is $(-1, 2)$; contains the point $(1, 6)$
 36. Vertex is $(3, -4)$; contains the point $(4, 2)$

Exercise 9.

Comparing Phone Companies Marissa must decide between one of two companies as her long-distance phone provider. Company A charges a monthly fee of \$7.00 plus \$0.06 per minute, while Company B does not have a monthly fee, but charges \$0.08 per minute.

- (a) Find a linear function that relates cost, C , to total minutes on the phone, x , for each company.
 (b) Determine the number of minutes x for which the bill from Company A will equal the bill from Company B.
 (c) Over what interval of minutes x will the bill from Company B be less than the bill from Company A?

Exercise 10.

Sales Commissions Bill was just offered a sales position for a computer company. His salary would be \$15,000 per year plus 1% of his total annual sales.

- (a) Find a linear function that relates Bill's annual salary, S , to his total annual sales, x .
 (b) In 2010, Bill had total annual sales of \$1,000,000. What was Bill's salary?
 (c) What would Bill have to sell to earn \$100,000?
 (d) Determine the sales required of Bill for his salary to exceed \$150,000

Exercise 11.

Demand Equation The price p (in dollars) and the quantity x sold of a certain product obey the demand equation $p = -\frac{1}{10}x + 150$ $0 \leq x \leq 1500$

- (a) Express the revenue R as a function of x .
 (b) What is the revenue if 100 units are sold?
 (c) What quantity x maximizes revenue? What is the maximum revenue?
 (d) What price should the company charge to maximize revenue?

Exercise 12.

Landscaping A landscape engineer has 200 feet of border to enclose a rectangular pond. What dimensions will result in the largest pond?

HOMEWORKS:

Exercise 1: 2

Exercise 2: 8

Exercise 3: 10

Exercise 4: 22

Exercise 5: 26

Exercise 6: 32

Exercise 7: 4

Exercise 8: 35, 36

Exercise 9

Exercise 10.