

1.1 Recitation Exercises

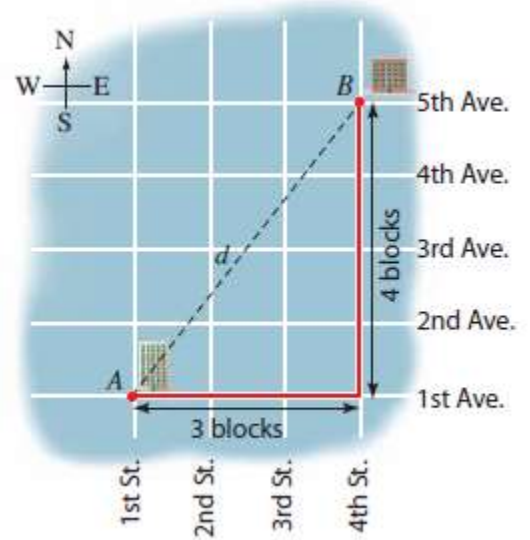
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1. Find a point on the  $y$ -axis that is **equidistant** from the points  $(5, -5)$  and  $(1, 1)$ .
2. Find the distance between the two points  $P(2x, -7x)$  and  $Q(-2x, -4x)$ , where  $x < 0$ .
3. If the point  $(1, 4)$  is 5 units from the midpoint of the line segment joining the points  $(3, -2)$  and  $(x, 4)$ , then  $x$  is equal to
  - A) either 7 or  $-9$
  - B)  $-15$
  - C) either  $4 + 3\sqrt{11}$  or  $4 - 3\sqrt{11}$
  - D) either  $-7$  or 9
  - E) 15
4. **Application:** Suppose that a video game player is located at point  $A(460, 420)$  and must move in a direct line to point  $B(80, 210)$  and then in a direct line to point  $C(120, 60)$  to pick up prizes before a 5-sec timer runs out. If the player moves at 120 pixels per second, will the player have enough time to pick up both prizes? Explain.

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**5. Application:** A city has streets that run north and south and avenues that run east and west, all equally spaced. Streets and avenues are numbered sequentially, as shown in the figure.

The walking distance between points  $A$  and  $B$  is 7 blocks that is, 3 blocks east and 4 blocks north, distance  $d$ , we must use the Distance Formula.



- (a) Find the straight-line distance (in blocks) between  $A$  and  $B$ .
- (b) Find the walking distance and the straight-line distance between the corner of 4th St. and 2nd Ave. and the corner of 11th St. and 26th Ave.
- (c) What must be true about the points  $P$  and  $Q$  if the walking distance between  $P$  and  $Q$  equals the straight-line distance between  $P$  and  $Q$ ?

1.2 Recitation Exercises

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1. Sketch the graph of the following equations.

a)  $y = |4 - x| + 1$

b)  $x = \sqrt{y - 1}$

2. If  $x^2 + y^2 - 4y = 5 - k^2$  is the equation of a circle which is tangent to the  $x$ -axis, then  $k =$

A)  $\pm\sqrt{5}$

B) 0

C)  $\pm 2$

D)  $\pm 5$

E)  $\pm 1$

3. Let  $M$  be the midpoint of the line whose endpoints are  $(1, -2)$  and  $(-3, 6)$ , and let  $C$  be the center of the circle  $x^2 + 4x + y^2 - 8y + 2 = 0$ . Then, find the distance between  $M$  and  $C$ .

4. Discuss the symmetry of the following equations.

a)  $x^2 = |x - y|$

b)  $|xy| + |x|y^3 = 1$

c)  $x = \frac{-2y}{xy \sqrt[3]{y}}$

5. **Application:** A cell tower is a site where antennas, transmitters, and receivers are placed to create a cellular network. Suppose that a cell tower is located at appoint  $A(4,6)$  on a map and its range is 1.5 mi. Write an equation that represents the boundary of the area that can receive a signal from the tower.

1.3 Recitation Exercises

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1. If  $A(-1, 2)$ ,  $B(-10, 5)$  and  $C(-4, k)$  are the vertices of a right triangle, where the right angle is at B, then find the value of  $k$ .
  
2. Find the value of  $k$  so that the line passing through the points  $(-2, -11)$  and  $(k, 2)$  is parallel to the line  $x + 2y = 1$ .
  
3. The equation of the line passing through  $(4, 1)$  and parallel to  $x = 5$  is  
 A)  $x = 5$       B)  $y = 1$       C)  $x = 1$       D)  $x = 4$       E)  $4x + y = -5$
  
4. The line with  $x$ -intercept  $\frac{1}{4}$  and  $y$ -intercept  $-\frac{1}{2}$  intersects the line  $y = 2$  at the point  $(p, q)$ . The value of  $p$  is  
 A)  $\frac{5}{4}$       B)  $1$       C)  $-\frac{5}{2}$       D)  $\frac{1}{2}$       E)  $\frac{3}{4}$
  
5. Find an equation for the line tangent to the circle  $x^2 + y^2 = 25$  at the point  $(3, -4)$ .
  
6. A point that lies on the line that is perpendicular to the line  $3y - 2x + 6 = 0$  and passes through the point  $(2, 3)$  is  
 A)  $(-2, 1)$       B)  $(1, 5)$       C)  $(4, 3)$       D)  $(6, -5)$       E)  $(3, \frac{3}{2})$

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7. A local diner must build a wheelchair ramp to provide handicap access to the restaurant. Federal building codes require that a wheelchair ramp must have a maximum rise of 1 in. for every horizontal distance of 12 in.

**(a)** What is the maximum allowable slope for a wheelchair ramp? Assuming that the ramp has maximum rise, find a relation  $H$  that models the height of the ramp above the ground as a function of the horizontal distance  $x$ .

**(b)** If the space available to build a ramp is 150 in. wide, how high does the ramp reach?

1.4 Recitation Exercises

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1. When completing the square in the equation  $4x(x - 2) = 7$ , we get  $(x + a)^2 = b$ , then  $a + b^2 =$

- A)  $\frac{105}{16}$       B)  $\frac{33}{16}$       C)  $\frac{137}{16}$       D)  $-\frac{7}{16}$       E)  $\frac{65}{16}$

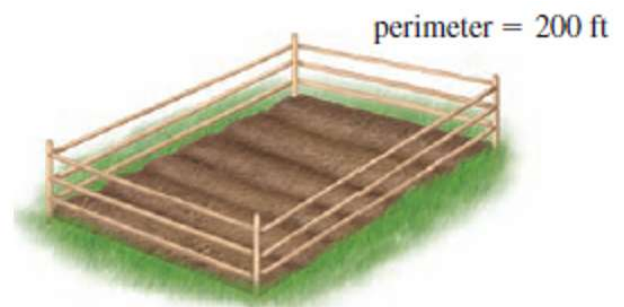
2. If the quadratic equation  $kx^2 = kx - 16$  has a double solution (two equal solutions), then  $k =$

- A) 0 and 64      B) 0      C) 64      D) 16      E) 0 and 16

3. a) If the sum and product of the two roots of the equation  $0.9x^2 + bx + c = 0$  are  $\frac{4}{3}$  and 1 respectively, then find the values of  $b$  and  $c$ .

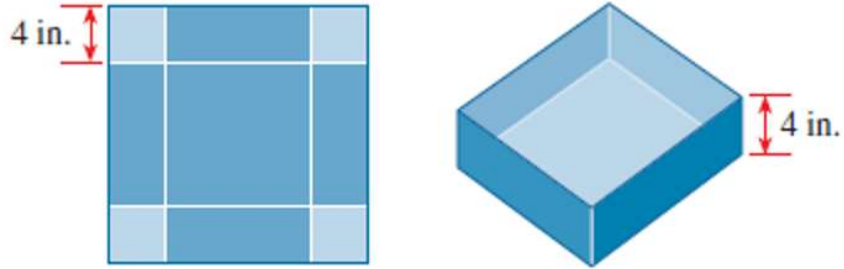
b) For the equation  $9x^2 - 1 - 4xy = 3y^2$ , solve for  $y$  in terms of  $x$ .

4. A farmer has a rectangular garden plot surrounded by 200 *ft* of fence. Find the length and width of the garden if its area is 2400 *ft*<sup>2</sup>.



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5. A box with a square base and no top is to be made from a square piece of cardboard by cutting 4-in. squares from each corner and folding up the sides, as shown in the figure. The box is to hold  $100 \text{ in}^3$ . How big a piece of cardboard is needed?



1.5 Recitation Exercises

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1. If  $\frac{(\sqrt[3]{-125}i - \sqrt{-25}\sqrt{-1})}{(2i-1)(2i+1)(-i)^{103}} = x + iy$ , then  $y - x =$

- A) 1
- B) 0
- C) -1
- D) 2
- E) -2

2. If  $Z = \left(\frac{2+i}{1-i}\right)^2 + \left(\frac{1+i}{1-i}\right)^{21}$ , then find the complex conjugate  $\bar{Z}$ .

3. If  $z = a + bi$  is the **reciprocal** of the complex number  $(\sqrt[3]{-27} + \sqrt{-9})i + \sqrt{(-5)^2}$ , then  $a + b =$

- A) -1
- B) 5
- C)  $-\frac{1}{13}$
- D)  $\frac{5}{13}$
- E)  $\frac{1}{13}$

4. Find all roots of the equation  $5x^2 + 2x + 3 = -1$ .



1.6 Recitation Exercises

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1. Solve each of the following equations.

a)  $x^4 - 5x^2 + 6 = 0$

b)  $\left(\frac{x}{x+2}\right)^2 = \frac{4x}{x+2} - 4$

c)  $\sqrt{x+2} = 1 - \sqrt{3x+7}$

2. The product of all the solutions of the equation  $\frac{1}{r} + \frac{2}{1-r} = \frac{4}{r^2}$  is

A) 16

B) 4

C) -4

D) 25

E) 9

3. The **sum** of all solutions of the equation  $2(2x-1)^{-\frac{2}{3}} + (2x-1)^{-\frac{1}{3}} = 1$  is

A)  $-\frac{1}{2}$

B)  $\frac{7}{2}$

C)  $\frac{9}{2}$

D)  $\frac{1}{2}$

E)  $\frac{9}{16}$

4. A large pond is stocked with fish. The fish population  $P$  is modeled by the formula  $P = 3t + 10\sqrt{t} + 140$ , where  $t$  is the number of days since the fish were first introduced into the pond. How many days will it take for the fish population to reach 500?

1.7 Recitation Exercises

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1. Find the solution set of the inequality. Write the answer in interval notation.

a)  $-\frac{1}{2} \leq \frac{4-3x}{5} \leq \frac{1}{4}$

b)  $4x^2 + 3x \leq 1$

c)  $\frac{(x-8)^8}{x^2+7x+12} \leq 0$

d)  $\frac{x}{2} \geq \frac{5}{x+1} + 4$

2. The solution set of the inequality  $0 < x^2 - 4 \leq 5$  is

A)  $(-3, -2] \cup (2, 3]$

B)  $(-3, 3]$

C)  $(-3, 3)$

D)  $[-3, -2) \cup (2, 3]$

E)  $(-3, -2]$

3. Car Rental Cost A car rental company offers two plans for renting a car.

Plan A: \$30 per day and 10¢ per mile

Plan B: \$50 per day with free unlimited mileage

For what range of miles will Plan B save you money?

4. Airline Ticket Price A charter airline finds that on its Saturday flights from Philadelphia to London all 120 seats will be sold if the ticket price is \$200.

However, for each \$3 increase in ticket price, the number of seats sold decreases

by one.

(a) Find a formula for the number of seats sold if the ticket price is P dollars.

(b) Over a certain period the number of seats sold for this flight ranged between 90 and 115. What was the corresponding range of ticket prices?

1.8 Recitation Exercises

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1. Solve each equation or inequality.

a)  $|x + 3| = |2x + 1|$

b)  $\left|\frac{5}{3} - \frac{1}{2}x\right| + \frac{1}{3} > \frac{5}{9}$

c)  $|3x + 2| < 1$

2. Find the **sum** of all solutions of the equation  $3|2 - x|^2 - 7|x - 2| = 6$ .

3. If  $|x - 5| < \frac{1}{2}$  is equivalent to  $m < 2x - 3 < n$ , then the values of  $m$  and  $n$  are

A)  $-1, 1$

B)  $-\frac{1}{2}, \frac{1}{2}$

C)  $6, 8$

D)  $3, 4$

E)  $9, 11$

4. If  $A$  is the solution set of  $\frac{x^2+14x+49}{x^2+x-12} \leq 0$  and  $B$  is the solution set of  $3 \leq |x| \leq 7$ , then  $A \cap B =$

A)  $[-7, 7)$

B)  $(-4, 3)$

C)  $\{-7\} \cup (-4, 3) \cup (3, 7)$

D)  $(-4, -3] \cup \{-7\}$

E)  $(-7, -3) \cup (3, 7)$

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5. A police officer uses a radar detector to determine that a motorist is traveling 34 mph in a 25-mph school zone. The driver goes to court and argues that the radar detector is not accurate. The manufacturer claims that the radar detector is calibrated to be in error by no more than 3 mph.
- If  $x$  represents the motorist's actual speed, write an inequality that represents an interval in which to estimate  $x$ .
  - Solve the inequality and interpret the answer. Should the motorist receive a speeding ticket?