3-6

More on Parallel and Perpendicular Lines

OBJECTIVES

- To write the equation of the perpendicular bisector of a line segment
- To find the distance between parallel lines

CLASS WORK

Write the slope intercept equation of the line parallel to the given line that contains point *C*.

10. $\overleftrightarrow{AB}$: $y = -5x + 12$; $C(-2, 1)$

11. $\overleftrightarrow{AB}$: $y = \frac{1}{5}x + 8$; $C(3, 6)$

CLASS WORK

Write the slope intercept equation of the line parallel to the given line that contains point *C*.

10. $\overleftrightarrow{AB}$: $y = -5x + 12$; $C(-2, 1)$

m $\quad$ x_1, y_1

$y - 1 = -5(x + 2)$

$y - 1 = -5x - 10$

$y = -5x - 9$

11. $\overleftrightarrow{AB}$: $y = \frac{1}{5}x + 8$; $C(3, 6)$

m $\quad$ x_1, y_1

$y - 6 = \frac{1}{5}(x - 3)$

$y - 6 = \frac{1}{5}x - \frac{3}{5} + \frac{30}{5}$

$+6$

$y = \frac{1}{5}x + \frac{27}{5}$

CLASS WORK

Write the slope intercept equation of the line perpendicular to the given line that contains *P*.

12. $P(4, 3)$; $y = -3x - 15$

CLASS WORK

Write the slope intercept equation of the line perpendicular to the given line that contains P.

12. $P(4, 3); y = -3x - 15$

x_1, y_1

new line: $+\frac{1}{3} = m$

$y - 3 = \frac{1}{3}(x - 4)$

$y - 3 = \frac{1}{3}x - \frac{4}{3} + \frac{9}{3}$

$+3$

$y = \frac{1}{3}x + \frac{5}{3}$

$3(y - 3) = 1(x - 4)$

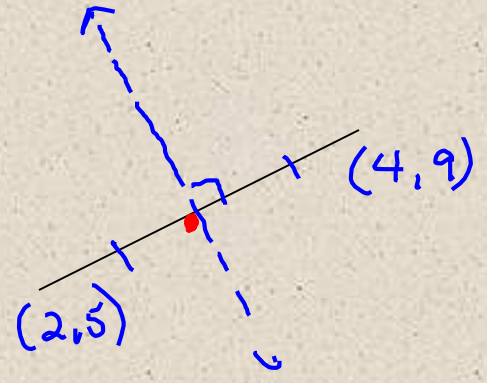
$3y - 9 = x - 4$

$\frac{3y}{3} = \frac{x}{3} + \frac{5}{3}$

$y = \frac{1}{3}x + \frac{5}{3}$

PERPENDICULAR BISECTORS

1. Write the equation of the perpendicular bisector of a line with the endpoints (2, 5) and (4, 9).



PERPENDICULAR BISECTORS

1. Write the equation of the perpendicular bisector of a line with the endpoints (2, 5) and (4, 9).

line segment

midpoint

$\left(\frac{2+4}{2}, \frac{5+9}{2}\right)$

$m = \frac{9-5}{4-2} = \frac{4}{2} = 2$

⊥ bisector

$(3, 7)$

x_1, y_1

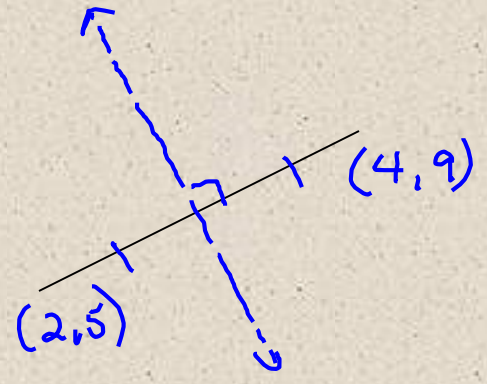
$m = -\frac{1}{2}$

$y - 7 = -\frac{1}{2}(x - 3)$

$2(y-7) = -1(x-3)$

$2y - 14 = -x + 3$

$\frac{2y}{2} = \frac{-x}{2} + \frac{17}{2}$



$y = -\frac{1}{2}x + \frac{17}{2}$

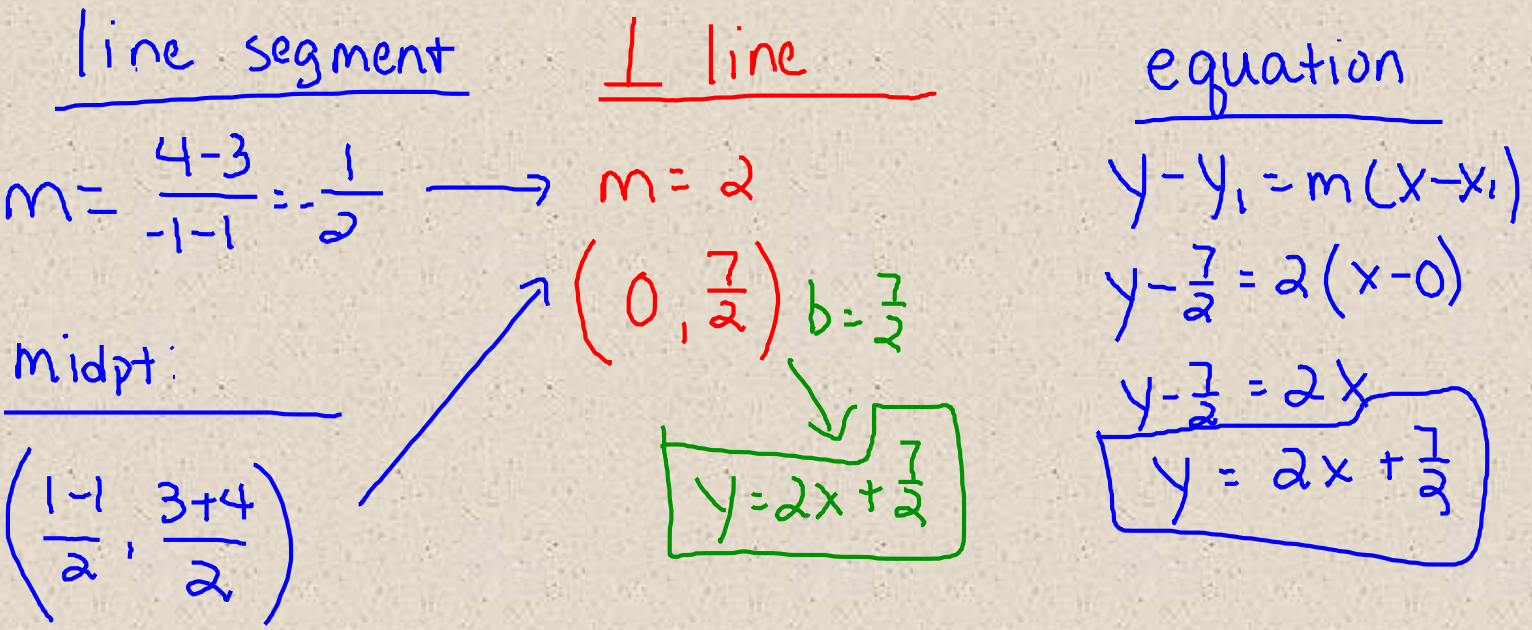
PERPENDICULAR BISECTORS

2. Write the equation of the perpendicular bisector of a line with the endpoints (1, 3) and (-1, 4).

To find the equation of any line, we need slope and a point on the line:
Step 1: Find the slope of the line containing the line segment.
Step 2: Find the opposite reciprocal slope of the line segment. (This will be the slope of the perpendicular bisector.)
Step 3: Find the midpoint of the segment. (This will be the point on the perpendicular bisector.)
Step 4: Write the equation of the perpendicular bisector.

PERPENDICULAR BISECTORS

2. Write the equation of the perpendicular bisector of a line with the endpoints (1, 3) and (-1, 4).

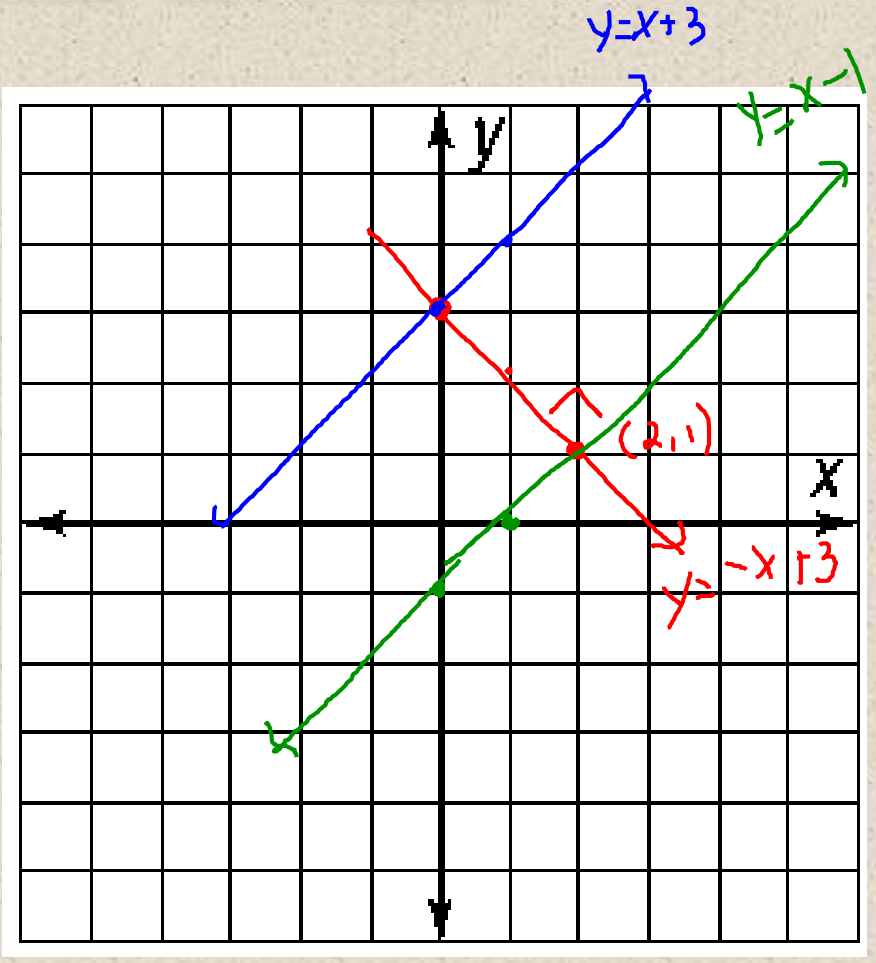


DISTANCE BETWEEN PARALLEL LINES

3. Find the distance between lines with the following equations:

$y = x + 3$

$y = x - 1$



DISTANCE BETWEEN PARALLEL LINES

3. Find the distance between lines with the following equations:

$y = x + 3$ (0, 3)

$y = x - 1$ (2, 1)

1 line:

$b = 3 \quad m = -1$

$y = -1x + 3$

$x - 1 = -x + 3$

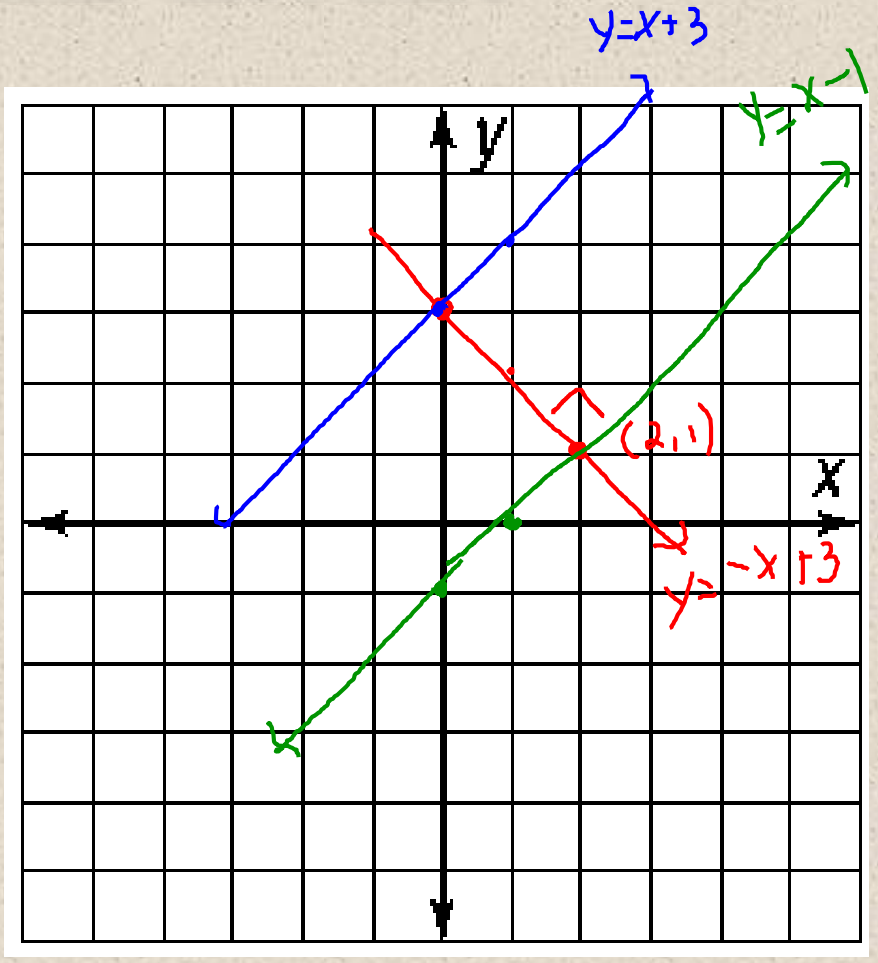
$2x = 4$

$x = 2$

$d = \sqrt{(2-0)^2 + (1-3)^2}$

$d = \sqrt{4+4} = \sqrt{8}$

$d = 2\sqrt{2} \approx 2.8$



DISTANCE BETWEEN PARALLEL LINES

4. Find the distance between lines with the following equations:

$y = -1x + 10$ (0, 10)

$y = -1x + 15$

To find the distance, we need to know where a perpendicular segment will intersect both of the parallel lines.

Step 1: Find the equation of a line perpendicular to line 1 at a chosen point.

Step 2: Find the intersection of the perpendicular line and line 2. (Solve the system of the two equations.)

Step 3: Find the distance between the intersection points for line 1 and line 2.

DISTANCE BETWEEN PARALLEL LINES

4. Find the distance between lines with the following equations:

$y = -1x + 10$

$y = -1x + 15$

DISTANCE BETWEEN PARALLEL LINES

4. Find the distance between lines with the following equations:

$y = -1x + 10$ $(0,10)$

$y = -1x + 15$ $(2.5, 12.5)$

$-1(2.5)+15=$

⊥ line

$b=10,\ m=1$

$y=1x+10$

Solve sys.

$-1x+15=1x+10$

$5=2x$

$2.5=x$

distance

$d=\sqrt{(2.5-0)^2+(12.5-10)^2}$

$d=\sqrt{6.25+6.25}$

$d=\sqrt{12.5}\approx 3.5$

HOMEWORK

Pages 194-195:

38 – 44 even

47 – 50 all