Name: _____ Grade: _____ Date: _____

Parallel and Perpendicular Lines

Q 1 : Find the slope of the line passing through the pairs of points and describe the line as rising, falling, horizontal or vertical.

a. (2 , 1) , (4 , 5)

b. (-1 , 0) , (3 , -5)

c. (2 , 1) , (-3 , 1)

d. (-1 , 2) , (-1 ,- 5)

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Q2: Determine whether the graphs of each pair of equations are ***parallel***, ***perpendicular*** or ***neither***.

1. $y = 3x + 4$

   $y = 3x + 7$

2. $y = -4x + 1$

   $4y = x + 3$

3. $y = 2x - 5$

   $y = 5x - 5$

4. $y = -1/3x + 2$

   $y = 3x - 5$

5. $y = 3/5x - 3$

   $5y = 3x - 10$

6. $y = 4$

   $4y = 6$

7. $y = 7x + 2$

   $x + 7y = 8$

8. $y = 5/6x - 6$

   $x + 5y = 4$

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Q3: Write the equation in slope-intercept form of the line that is ***parallel*** to the graph of each equation and passes through the given point.

1. $y = 3x + 6$; (4, 7)

2. $y = x - 4$; (-2, 3)

3. $y = \frac{1}{2} x + 5$; (4, -5)

4. $y + 2x = 4$; (-1, 2)

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Q4: Write the equation in slope-intercept form of the line that is ***perpendicular*** to the graph of each equation and passes through the given point.

1. $y = -5x + 1$; (2, -1)

2. $y = 2x – 3$; (-5, 3)

3. $y = -4x - 2$; (4, -4)

4. $7y + 4x = 3$; (-4, -7)

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Q 5: Are the lines L1 and L2 passing through the given pairs of points ***parallel***, ***perpendicular*** or ***neither parallel nor perpendicular***?

a. L1: (1 , 2) , (3 , 1) and L2: (0 , -1) , (2 , 0)

b. L1: (0 , 3) , (3 , 1) and L2: (-1 , 4) , (-7 , -5)

c. L1: (2 , -1) , (5 , -7) and L2: (0 , 0) , (-1 , 2)

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d. L1: (1 , 0) , (2 , 0) and L2: (5 , -5) , (-10 , -5)

e. L1: (-2 , 5) , (-2 , 7) and L2: (5 , 1) , (5 , 13)

Q6: Is it possible for two lines with negative slopes to be perpendicular?

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Solution to Q1:

a. The slope of the line is given by
m = (5 - 1) / (4 - 2) = 4 / 2 = 2
Since the slope is positive, the line rises as x increases.

b. The slope of the line is given by
m = (-5 - 0) / (3 - (-1)) = -5 / 4
Since the slope is negative, the line falls as x increases.

c. We first find the slope of the line
m = (1 - 1) / (-3 - 2) = 0
Since the slope is equal to zero, the line is horizontal (parallel to the x axis).

d. The slope of the line is given by
m = (-5 - 2) / (-1 - (-1))
Since (-1 - (-1)) = 0 and the division by 0 is not defined, the slope of the line is undefined and the line is vertical. (parallel to the y axis).

Solution to Q5:

In what follows, m1 is the slope of line L1 and m2 is the slope of line L2.

a. Find the slope m1 of line L1 and the slope m2 of line L1
m1 = (1 - 2) / (3 - 1) = -1 / 2
m2 = (0 - (-1)) / (2 - 0) = 1/2
The two slopes m1 and m2 are not equal and their products is not equal to -1. Hence the two lines are neither parallel nor perpendicular.

b. m1 = (1 - 3) / (3 - 0) = -2 / 3
m2 = (-5 - 4) / (-7 - (-1)) = -9 / -6 = 3/2
The product of the two slopes m1*m2 = (-2 / 3)(3 / 2) = -1, the two lines are perpendicular.

c. m1 = (-7 - (-1)) / (5 - 2) = -6 / 3 = -2
m2 = (2 - 0) / (-1 - 0) = -2
The two slopes are equal, the two lines are parallel.

d. m1 = (0 - 0) / (2 - 1) = 0 / 1 = 0
m2 = (-5 - (-5)) / (-10 - 5) = 0 / -15 = 0
The two slopes are equal , the two lines are parallel. Also the two lines are horizontal

e. m1 = (7 - 5) / (-2 - (-2))
m2 = (13 - 1) / (5 - 5)
The two slopes are both undefined since the denominators in both m1 and m2 are equal to zero. The two lines are vertical lines and therefore parallel.

Solution to Q6:

No. If both slopes are negative, their product can never be equal to -1.

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