BECA / Dr. Huson / Geometry
Unit 9: Algebra
1 April 2022

Name: Solutions

9.10 Test: Linear & quadratic functions on the coordinate plane

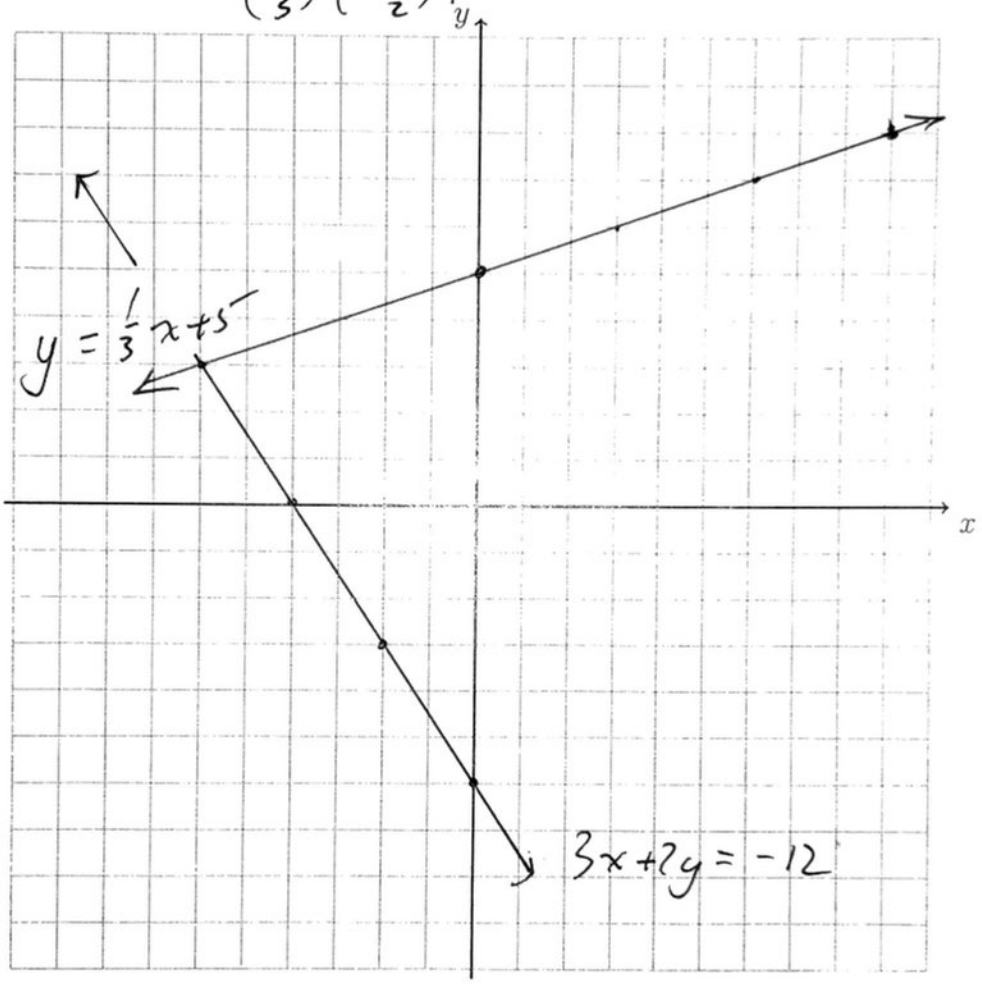
1. Graph and label the two equations. Mark their intersection as an ordered pair.

$y = \frac{1}{3}x + 5$ $m_1 = \frac{1}{3}$ $3x + 2y = -12$ $y = -\frac{3}{2}x - 6$

Are the lines parallel, perpendicular, or neither? Justify your answer.

Neither. $\frac{1}{3} \neq -\frac{3}{2}$ $m_2 = -\frac{3}{2}$

$\left(\frac{1}{3}\right)\left(-\frac{3}{2}\right) \neq -1$



2. Find each value as a decimal rounded to three significant figures.

(a) 5.53581 5.54

(b) 24.34998 24.3

(c) $5 - \sqrt{3}$ $= 3.267\,44\ldots$ ≈ 3.27

(d) 3π $= 9.42477\ldots$ ≈ 9.42

3. The line l has the equation $y = -\frac{4}{3}x + 7$. $m = -\frac{4}{3}$

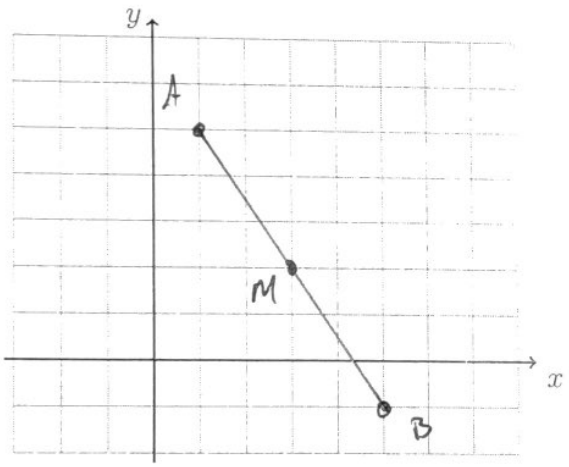
   (a) What is the slope of the line k, given $k \parallel l$?

   $$-\frac{4}{3}$$

   (b) What is the slope of the line m, given $m \perp l$?

   $$+\frac{3}{4}$$

4. On the graph below, draw $\overline{AB}$, with $A(1,5)$ and $B(5,-1)$, labeling the end points. Determine and state the coordinates of the midpoint M of $\overline{AB}$ and mark and label it on the graph.



$$M = \left(\frac{1+5}{2}, \frac{5+(-1)}{2}\right)$$
$$= (3, 2)$$

5. Given $K(1,6)$ and $L(7,4)$, find the length of $\overline{KL}$, expressed as a simplified radical.

   Use: $l = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$= \sqrt{(7-1)^2 + (4-6)^2}$$
$$= \sqrt{36+4}$$
$$= \sqrt{40} = 2\sqrt{10}$$

6. A translation maps $A(1, 12) \to A'(-3, 2)$. What is the image of $B(10, -2)$ under the same translation?

$T_{-4,-10}$ $B'(6, -12)$

In the following two problems, solve for the value of x.

7. $\frac{1}{5}(10x + 5) = 3$

$2x + 1 = 3$

$x = 1$

8. $\frac{2}{3}(5 - x) = -4$

$2(5 - x) = -12$

$10 - 2x = -12$

$x = 11$

9. Given $f(x) = \frac{1}{3}x + 3$. Solve for x such that for $f(x) = 2$.

$f(x) = \frac{1}{3}x + 3 = 2$

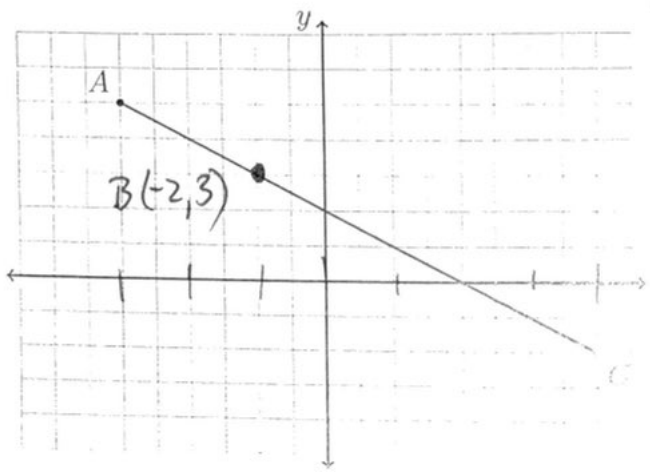
$x = -3$

10. Given $g(x) = -2x^2 - 5x + 3$. Simplify $g(1)$.

$g(1) = -2(1^2) - 5(1) + 3$

$= -4$

11. In the diagram below, $\overline{AC}$ has endpoints with coordinates $A(-6,5)$ and $C(8,-2)$.



$T_{+14,-7}$

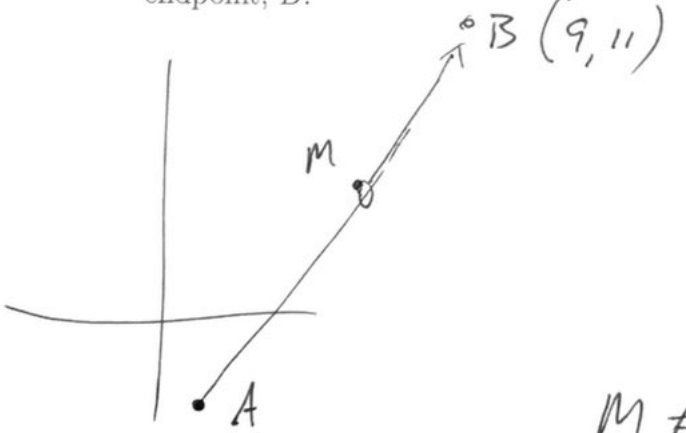
$\frac{2}{7}T = +4,-2$

If B is a point on $\overline{AC}$ and $AB{:}BC = 2{:}5$, what are the coordinates of B?

$A(-6,5) + (+4,-2) = B(-2,3)$ $\quad \frac{2}{7} : \frac{5}{7}$

$B(-2,3)$

12. $A(1,-3)$ is one endpoint of $\overline{AB}$. The segment's midpoint is $M(5,4)$. Find the other endpoint, B.



$\vec{AM} = (+4,+7)$

$M + \vec{AM} = (5,4) + (+4,+7)$

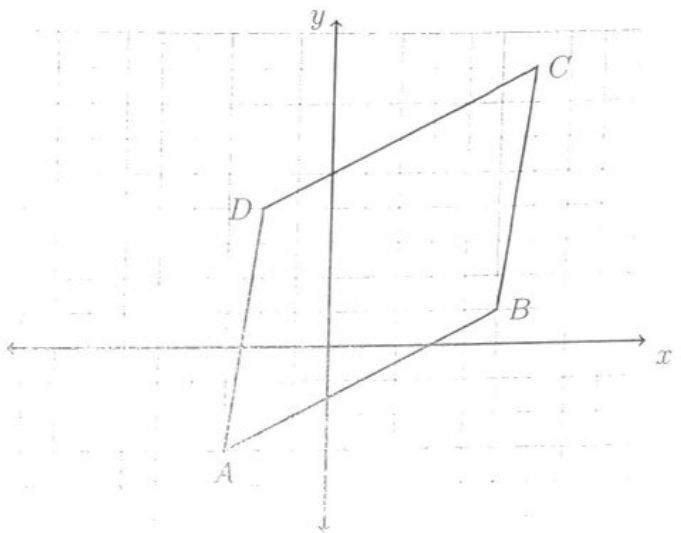
$= B(9,11)$

OR

$M(5,4) = \left(\frac{1+x_B}{2}, \frac{-3+y_B}{2}\right)$

$(9, 11) = (x_B, y_B)$

13. Spicy: Shown below is the quadrilateral $ABCD$ having coordinates $A(-3,-3)$, $B(5,1)$, $C(6,8)$, and $D(-2,4)$.



Given that $\overline{AD} \parallel \overline{BC}$.

(a) Find the slopes of $\overline{AB}$ and $\overline{CD}$

$$m_{\overline{AB}} = \frac{1-(-3)}{5-(-3)} = \frac{4}{8} = \frac{1}{2}$$

$$m_{\overline{CD}} = \frac{4-8}{-2-6} = \frac{-4}{-8} = \frac{1}{2}$$

(b) Hence, show that $\overline{AB} \parallel \overline{CD}$

$$m_{\overline{AB}} = m_{\overline{CD}} \Rightarrow \overline{AB} \parallel \overline{CD}$$

(c) Use the definition that a parallelogram is a quadrilateral with two pairs of parallel sides to prove $ABCD$ is a parallelogram.

$ABCD$ is a parallelogram because
$\overline{AD} \parallel \overline{BC}$ given
$\overline{AB} \parallel \overline{CD}$