

In Problems 1 – 6, determine if the item is LINEAR or NOT.  
 Circle your answer.

[ 2 Points Each ]

1.)  $y = 2x^3 + 5$

LINEAR NOT

2.)  $y = \sqrt{x-2} - 3$

LINEAR NOT

3.)  $3x - 4y = 10$

LINEAR NOT

4.)  $y = |2x - 1|$

LINEAR NOT

5.)  $y = \frac{5}{x} - 4$

LINEAR NOT

6.)  $y = 3^x + 4$

LINEAR NOT

In Problems 7-8, determine if the table represents a linear pattern.  
 SHOW CONVINCING WORK AND EXPLANATION!

[ 3 Points Each ]

7.)

$m=6$  always!  
 Same Slope → Yes Linear

x	1	2	4	5	9
y	8	14	26	32	56

$\Delta x: +1, +2, +1, +4$   
 $\Delta y: +6, +12, +6, +24$   
 $m = \frac{6}{1} = 6$     $m = \frac{12}{2} = 6$     $m = \frac{6}{1} = 6$     $m = \frac{24}{4} = 6$

8.)

$m=2$  and  $m=1$   
 Slopes NOT equal  
Not Linear

x	2	3	5	6	7
y	10	12	14	16	18

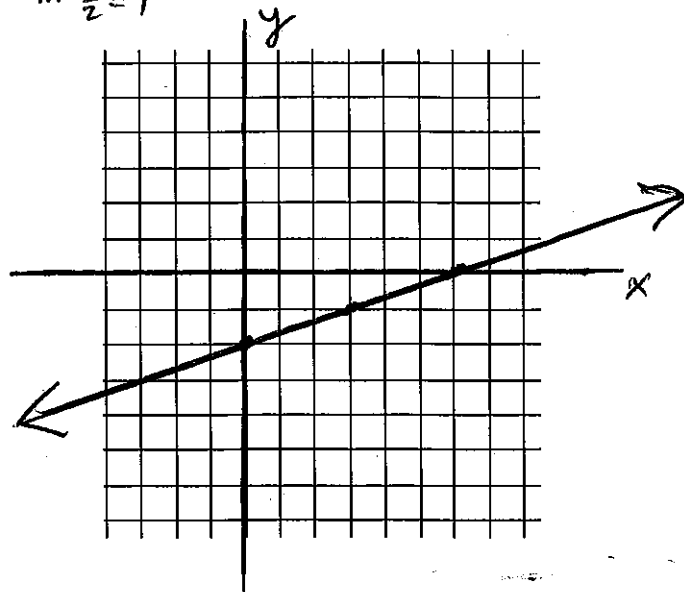
$\Delta x: +1, +2, +1, +1$   
 $\Delta y: +2, +2, +2, +2$   
 $m = \frac{2}{1} = 2$     $m = \frac{2}{2} = 1$

9.) Graph using a table of values.  
 [ 5 Points ]

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

$y = \frac{1}{3}(3) - 2 = -1$   
 $y = \frac{1}{3}(6) - 2 = 0$

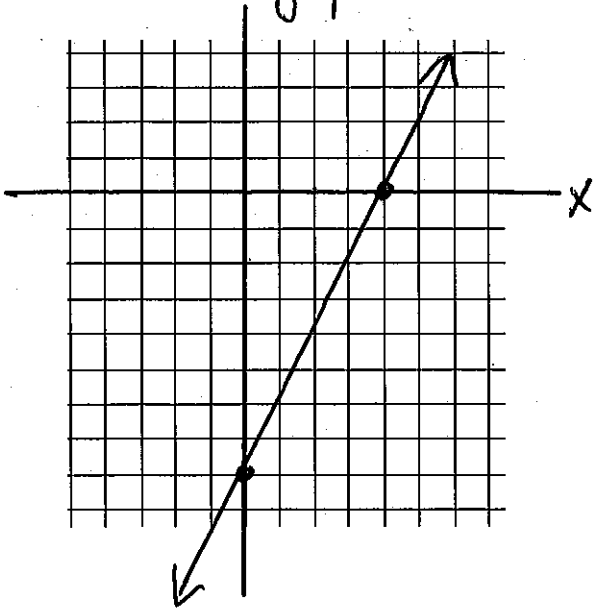
x	y
0	-2
3	-1
6	0



- 10.) Graph using intercepts. [ 5 Points ]  
(x- and y-intercepts)

$$6x - 3y = 24$$

<p>X int (y=0)</p> $6x = 24$ $x = 4$ <p>(4, 0)</p>	<p>Y int (x=0)</p> $-3y = 24$ $y = -8$ <p>(0, -8)</p>
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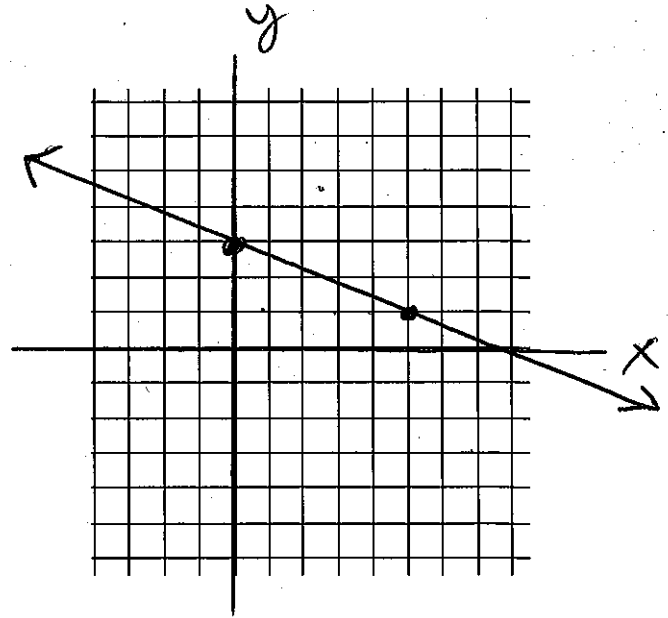


- 11.) Graph using slope-intercept form. [ 5 Points ]

$$2x + 5y = 15$$

$$5y = -2x + 15$$

$$y = -\frac{2}{5}x + 3$$



- 12.) Write the equation of the line containing the point  $(-\frac{9}{4}, 12)$  parallel to  $5x - 2y = 6$   
[ 6 Points ]

Parallel Lines  
have the Same Slope

$$m = \frac{5}{2}; (-\frac{9}{4}, 12)$$

$$y = mx + b$$

$$12 = \frac{5}{2}(-\frac{9}{4}) + b$$

$$12 = -\frac{45}{8} + b$$

$$\frac{141}{8} = b$$

$$y = \frac{5}{2}x + \frac{141}{8}$$

$$5x - 2y = 6$$

$$-2y = -5x + 6$$

$$y = \frac{5}{2}x - 3$$

$$m = \frac{5}{2}$$

In Problems 13 – 14, solve the system of equations using the indicated method.

[ 6 Points Each ]

13.) By Graphing!

$$\begin{cases} 2x + 3y = 9 \\ 3x - y = 8 \end{cases}$$

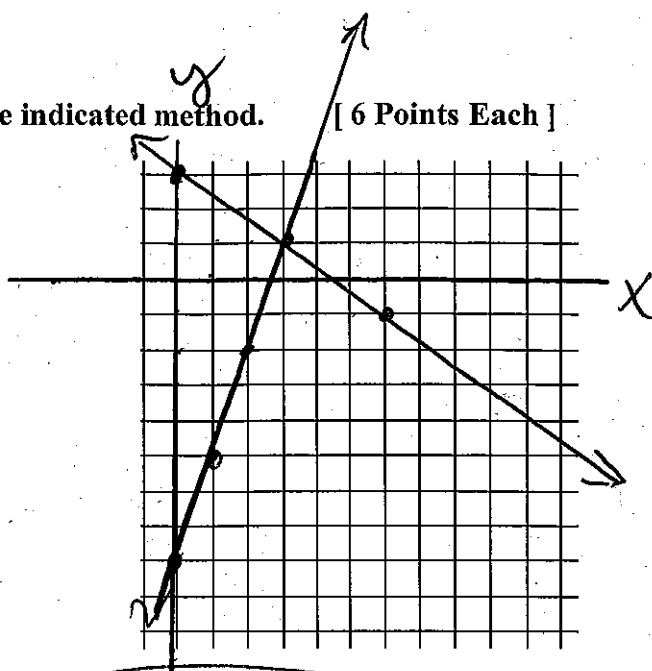
$$3y = -2x + 9$$

$$y = -\frac{2}{3}x + 3$$

$$3x = y + 8$$

$$3x - 8 = y$$

$$y = 3x - 8$$



Intersect at  $(3, 1) \rightarrow x = 3, y = 1$

14.) By Substitution OR Elimination!

$$\begin{cases} 7x - 3y = 8 \\ 2x - 5y = 10 \end{cases}$$

$$-21x + 14y = 56$$

$$10x - 14y = 20$$

$$\hline -11x = 76$$

$$x = -\frac{76}{11}$$

$$-3\left(-\frac{76}{11}\right) + 2y = 8$$

$$\frac{228}{11} + 2y = 8$$

$$2y = -\frac{140}{11}$$

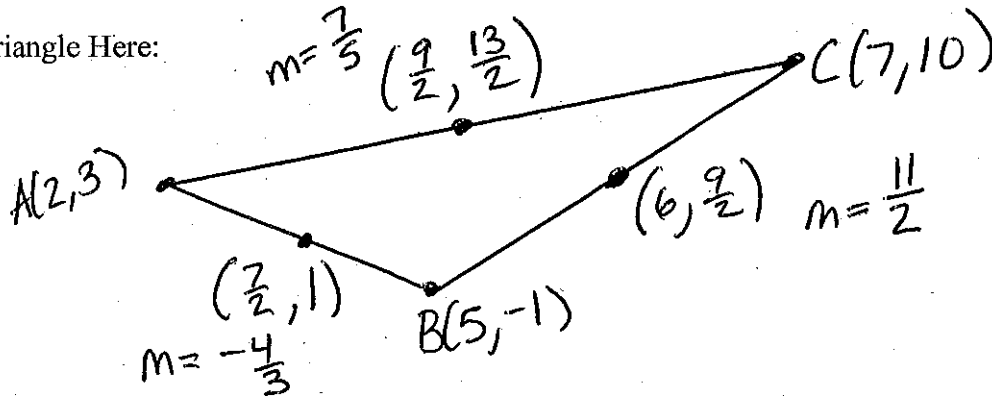
$$y = -\frac{70}{11}$$

15.) Given  $\triangle ABC$  with  $A(2, 3)$ ,  $B(5, -1)$ , and  $C(7, 10)$ , find the following:

[ 24 Points ]

BE ORGANIZED!! SHOW YOUR WORK IF YOU WANT ANY CREDIT!

Draw Triangle Here:



*See next 2 pages for work!*

A.) The equations of each of the Altitudes of the triangle AND

the point where they intersect (show it works in all three).

(An altitude goes from a vertex perpendicular to the opposite side.)

Place ANSWER here:

Line #1:  $y = \frac{3}{4}x + \frac{19}{4}$

Line #2:  $y = -\frac{2}{11}x + \frac{37}{11}$

Line #3:  $y = -\frac{5}{7}x + \frac{18}{7}$

Intersection Point $(-\frac{61}{41}, \frac{149}{41})$
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B.) The equations of each of the Perpendicular Bisectors of the triangle AND the point where they intersect.

(show it works in all three).

(A perpendicular bisector goes perpendicular to a side and through the midpoint of that side.)

Place ANSWER here:

Line #1:  $y = \frac{3}{4}x - \frac{13}{8}$

Line #2:  $y = -\frac{2}{11}x + \frac{123}{22}$

Line #3:  $y = -\frac{5}{7}x + \frac{68}{7}$

Intersection Point $(\frac{635}{82}, \frac{343}{82})$
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C.) The equations of each of the Medians of the triangle AND

the point where they intersect. (show it works in all three).

(A median goes from a vertex to the midpoint of the opposite side.)

Place ANSWER here:

Line #1:  $y = \frac{18}{7}x - 8$

Line #2:  $y = \frac{3}{8}x + \frac{9}{4}$

Line #3:  $y = -15x + 74$

Intersection Point $(\frac{14}{3}, 4)$
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### A.) Altitudes

→ to  $\overline{AB}$ :  $m = \frac{3}{4}$ ;  $(7, 10)$

$$y = mx + b$$

$$10 = \frac{3}{4}(7) + b$$

$$10 = \frac{21}{4} + b$$

$$\frac{19}{4} = b$$

$y = \frac{3}{4}x + \frac{19}{4}$

→ to  $\overline{BC}$ :  $m = -\frac{2}{11}$ ;  $(2, 3)$

$$y = mx + b$$

$$3 = -\frac{2}{11}(2) + b$$

$$3 = -\frac{4}{11} + b$$

$$\frac{37}{11} = b$$

$y = -\frac{2}{11}x + \frac{37}{11}$

→ to  $\overline{AC}$ :  $m = -\frac{5}{7}$ ;  $(5, -1)$

$$y = mx + b$$

$$-1 = -\frac{5}{7}(5) + b$$

$$-1 = -\frac{25}{7} + b$$

$$\frac{18}{7} = b$$

$y = -\frac{5}{7}x + \frac{18}{7}$

Intersection:  $(-\frac{61}{41}, \frac{149}{41})$

$$\begin{cases} y = \frac{3}{4}x + \frac{19}{4} \\ y = -\frac{2}{11}x + \frac{37}{11} \\ y = -\frac{5}{7}x + \frac{18}{7} \end{cases}$$

$$44\left(\frac{3}{4}x + \frac{19}{4}\right) = \left(-\frac{2}{11}x + \frac{37}{11}\right)44$$

$$33x + 209 = -8x + 148$$

$$41x = -61$$

$$x = -\frac{61}{41}$$

Check

$y = \frac{3}{4}\left(-\frac{61}{41}\right) + \frac{19}{4}$	$y = -\frac{2}{11}\left(-\frac{61}{41}\right) + \frac{37}{11}$	$y = -\frac{5}{7}\left(-\frac{61}{41}\right) + \frac{18}{7}$
$y = \frac{149}{41}$	$y = \frac{149}{41}$	$y = \frac{149}{41}$
✓	✓	✓

### B.) Perpendicular Bisectors

→ to  $\overline{AB}$ :  $m = \frac{3}{4}$ ;  $(\frac{7}{2}, 1)$

$$y = mx + b$$

$$1 = \frac{3}{4}\left(\frac{7}{2}\right) + b$$

$$1 = \frac{21}{8} + b$$

$$-\frac{13}{8} = b$$

$y = \frac{3}{4}x - \frac{13}{8}$

→ to  $\overline{BC}$ :  $m = -\frac{2}{11}$ ;  $(6, \frac{9}{2})$

$$y = mx + b$$

$$\frac{9}{2} = -\frac{2}{11}(6) + b$$

$$\frac{9}{2} = -\frac{12}{11} + b$$

$$\frac{123}{22} = b$$

$y = -\frac{2}{11}x + \frac{123}{22}$

→ to  $\overline{AC}$ :  $m = -\frac{5}{7}$ ;  $(\frac{9}{2}, \frac{13}{2})$

$$y = mx + b$$

$$\frac{13}{2} = -\frac{5}{7}\left(\frac{9}{2}\right) + b$$

$$\frac{68}{7} = b$$

$y = -\frac{5}{7}x + \frac{68}{7}$

### Intersection:

$$\begin{cases} y = \frac{3}{4}x - \frac{13}{8} \\ y = -\frac{2}{11}x + \frac{123}{22} \\ y = -\frac{5}{7}x + \frac{68}{7} \end{cases}$$

$(\frac{635}{82}, \frac{343}{82})$

$$56\left(\frac{3}{4}x - \frac{13}{8}\right) = \left(-\frac{5}{7}x + \frac{68}{7}\right)56$$

$$42x - 91 = -40x + 544$$

$$82x = 635$$

$$x = \frac{635}{82}$$

Check

$y = \frac{3}{4}\left(\frac{635}{82}\right) - \frac{13}{8}$	$y = -\frac{2}{11}\left(\frac{635}{82}\right) + \frac{123}{22}$	$y = -\frac{5}{7}\left(\frac{635}{82}\right) + \frac{68}{7}$
$y = \frac{343}{82}$	$y = \frac{343}{82}$	$y = \frac{343}{82}$

### C.) Medians

→ to  $\overline{AB}$ :  $(7, 10), (\frac{7}{2}, 1)$ : →  $m = \frac{18}{7}; (7, 10)$

$$m = \frac{1-10}{\frac{7}{2}-7} = \frac{-9}{-\frac{7}{2}} = \frac{18}{7}$$
$$y = mx + b$$
$$10 = \frac{18}{7}(7) + b$$
$$10 = 18 + b$$
$$-8 = b$$

$$y = \frac{18}{7}x - 8$$

→ to  $\overline{BC}$ :  $(6, \frac{9}{2}), (2, 3)$ : →  $m = \frac{3}{8}; (2, 3)$

$$m = \frac{3 - \frac{9}{2}}{2 - 6} = \frac{-\frac{3}{2}}{-4} = \frac{3}{8}$$
$$y = mx + b$$
$$3 = \frac{3}{8}(2) + b$$
$$3 = \frac{3}{4} + b$$
$$\frac{9}{4} = b$$

$$y = \frac{3}{8}x + \frac{9}{4}$$

→ to  $\overline{AC}$ :  $(\frac{9}{2}, \frac{13}{2}), (5, -1)$ : →  $m = -15; (5, -1)$

$$m = \frac{-1 - \frac{13}{2}}{5 - \frac{9}{2}} = \frac{-\frac{15}{2}}{\frac{1}{2}} = -15$$
$$y = mx + b$$
$$-1 = -15(5) + b$$
$$-1 = -75 + b$$
$$74 = b$$

$$y = -15x + 74$$

### Intersection:

$$\begin{cases} y = \frac{18}{7}x - 8 \\ y = \frac{3}{8}x + \frac{9}{4} \\ y = -15x + 74 \end{cases} \rightarrow 7\left(\frac{18}{7}x - 8\right) = (-15x + 74) \cdot 7$$

$$18x - 56 = -105x + 518$$

$$123x = 574$$

$$x = \frac{574}{123}$$

$$x = \frac{14}{3}$$

$$\left(\frac{14}{3}, 4\right)$$

### Check:

$$y = \frac{18}{7}\left(\frac{14}{3}\right) - 8$$

$$y = 4$$

$$y = \frac{3}{8}\left(\frac{14}{3}\right) + \frac{9}{4}$$

$$y = 4$$

$$y = -15\left(\frac{14}{3}\right) + 74$$

$$y = 4$$