

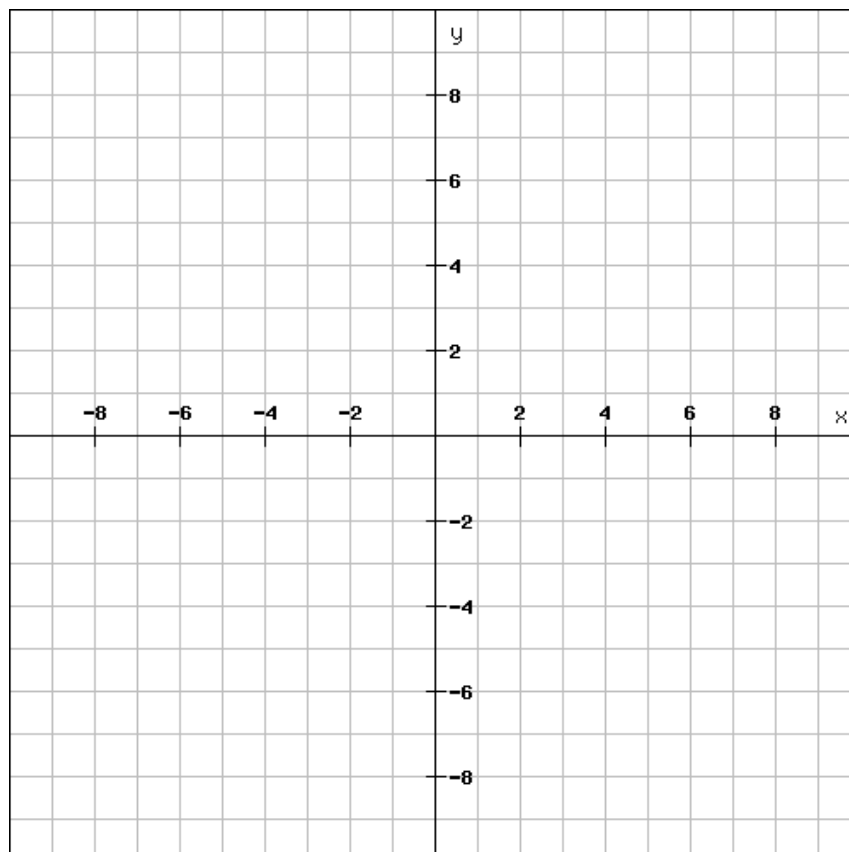
2.2. – LINEAR FUNCTIONS

1. Given the function: $f(x) = -5$

- Complete the following table:

X	-5	-4	-3	-2	-1	0	1	2	3	4	5
f(x)											

- Sketch the points of the chart on a graph (use a ruler).
- State the domain of the function: _____
- State the y intercept (sketched on the graph: (____, ____))
- State the x intercept: (____, ____)
- The function is increasing on the interval: _____
- The function is decreasing on the interval: _____
- Sketch the function of the graph used for the points initially drawn
- State the range of the function: _____

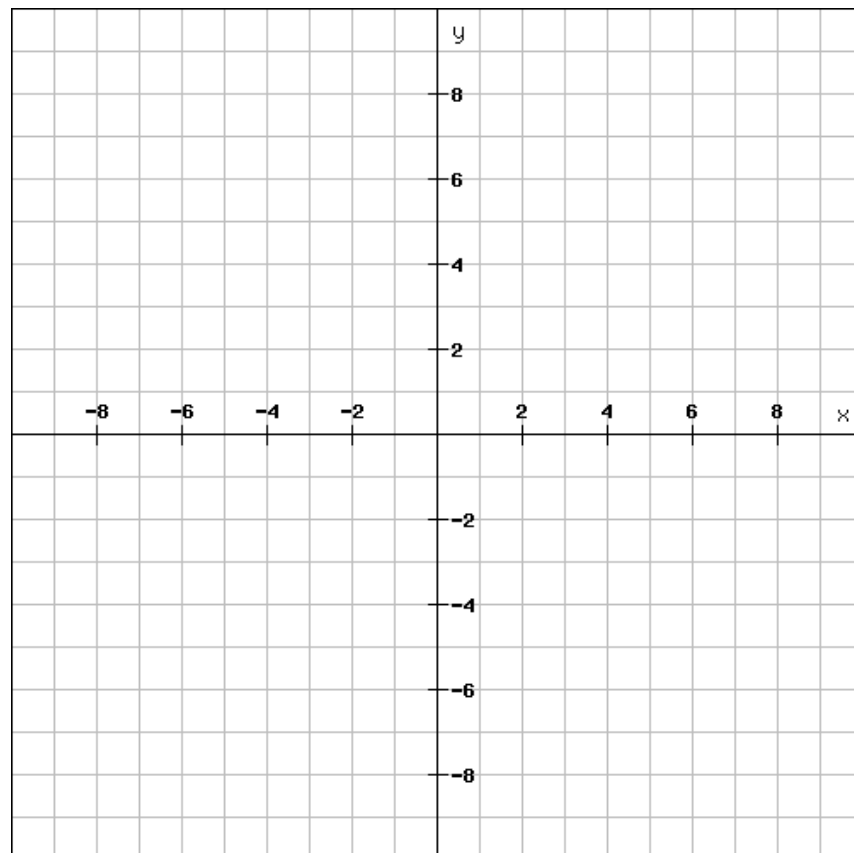


2. Given the function: $f(x) = x + 3$

- Complete the following table:

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
f(x)											

- Sketch the points of the chart on a graph (use a ruler).
- State the domain of the function: _____
- State the y intercept (sketched on the graph: (____, ____))
- State the x intercept: (____, ____)
- The function is increasing on the interval: _____
- The function is decreasing on the interval: _____
- Sketch the function of the graph used for the points initially drawn
- State the range of the function: _____

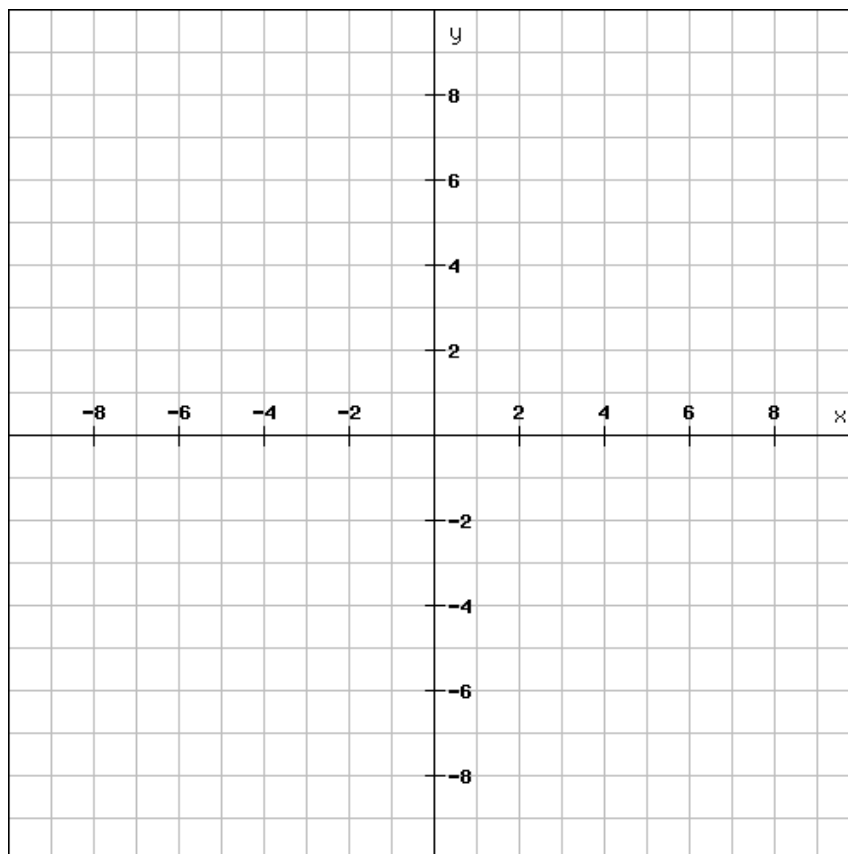


3. Given the function: $f(x) = -2x - 5$

- Complete the following table:

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
f(x)											

- Sketch the points of the chart on a graph (use a ruler).
- State the domain of the function: _____
- State the y intercept (sketched on the graph: (____, ____))
- State the x intercept: (____, ____)
- The function is increasing on the interval: _____
- The function is decreasing on the interval: _____
- Sketch the function of the graph used for the points initially drawn
- State the range of the function: _____

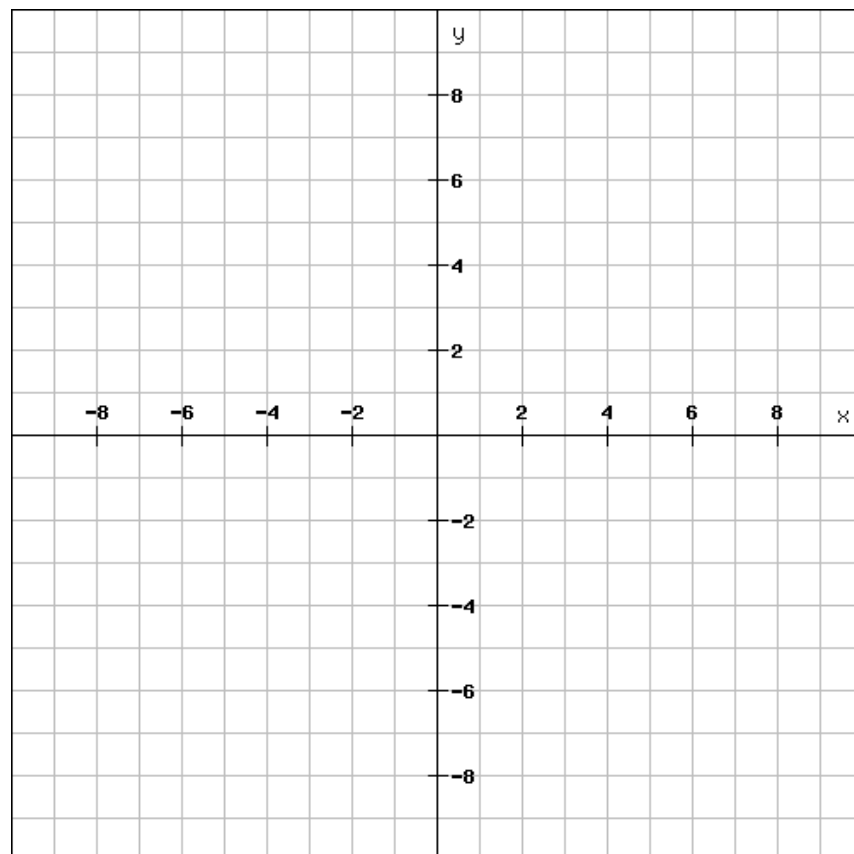


4. Given the function: $f(x) = 4x - 3$

- Complete the following table:

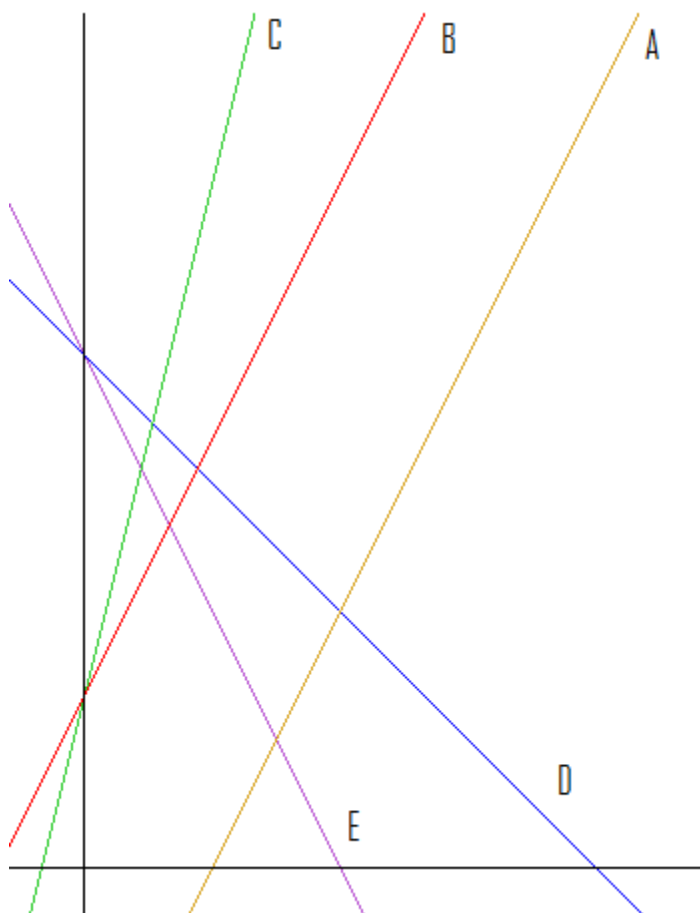
x	-5	-4	-3	-2	-1	0	1	2	3	4	5
f(x)											

- Sketch the points of the chart on a graph (use a ruler).
- State the domain of the function: _____
- State the y intercept (sketched on the graph: (____, ____))
- State the x intercept: (____, ____)
- The function is increasing on the interval: _____
- The function is decreasing on the interval: _____
- Sketch the function of the graph used for the points initially drawn
- State the range of the function: _____



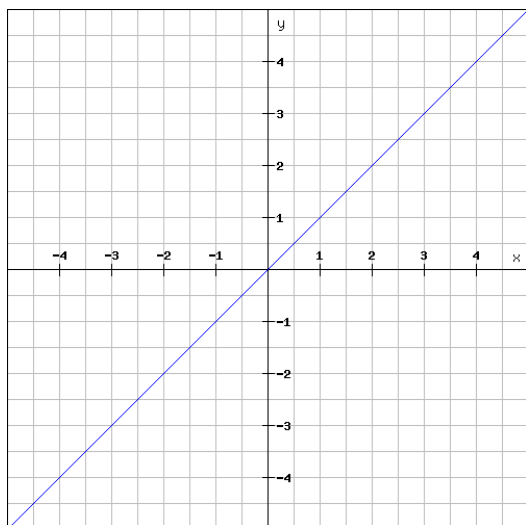
5. Given below are the equations for five different lines. Match the function with its graph.

Function	On the graph
$f(x) = 20 + 2x$	
$g(x) = 4x + 20$	
$s(x) = -30 + 2x$	
$a(x) = 60 - x$	
$b(x) = -2x + 60$	

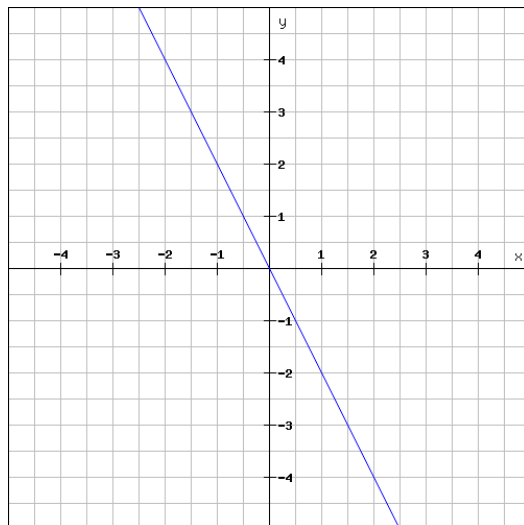


- The general functions that describes a straight line is _____
- We know a function is a straight line because _____
- The y-intercept (also called vertical intercept), tells us where the line crosses the _____. The corresponding point is of the form (,).
- The x-intercept (also called horizontal intercept), tells us where the line crosses the _____. The corresponding point is of the form (,).
- If $m > 0$, the line _____ left to right. If _____ the line decreases left to right.
- In case the line is horizontal m is _____ and the line is of the form _____.
- The larger the value of m is, the _____ the graph of the line is.

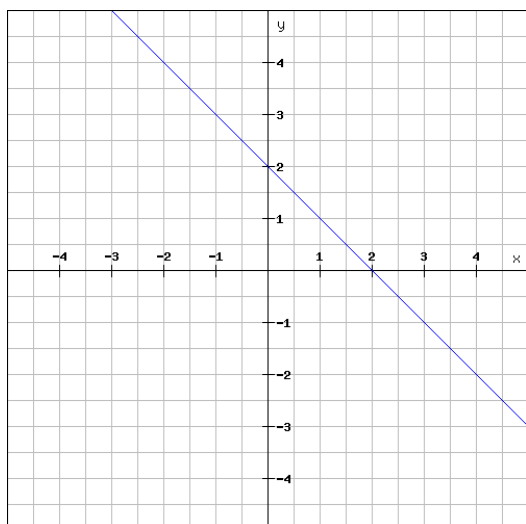
13. Given the graph, write, the slope (m), b and the equation of the line:



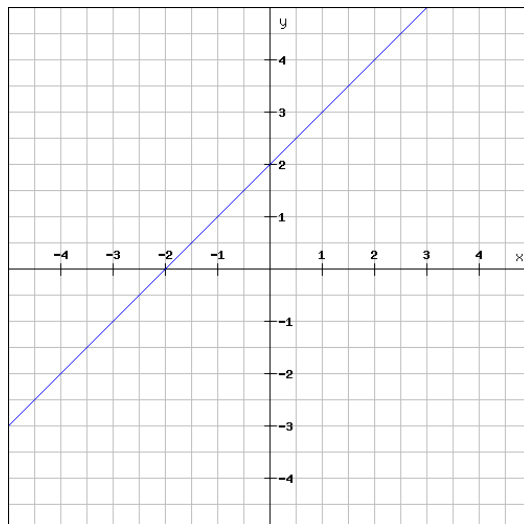
m = ____ b = ____ f(x) = ____



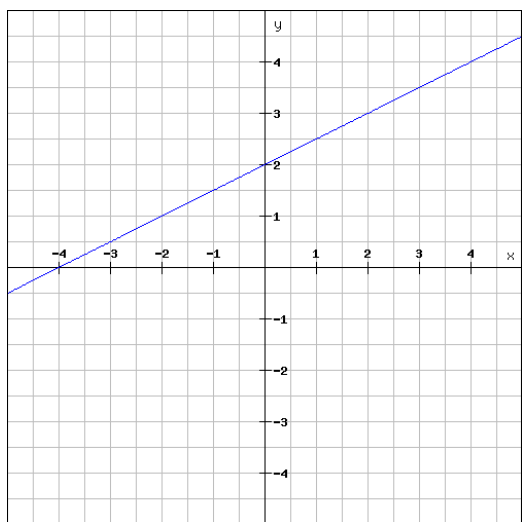
m = ____ b = ____ f(x) = ____



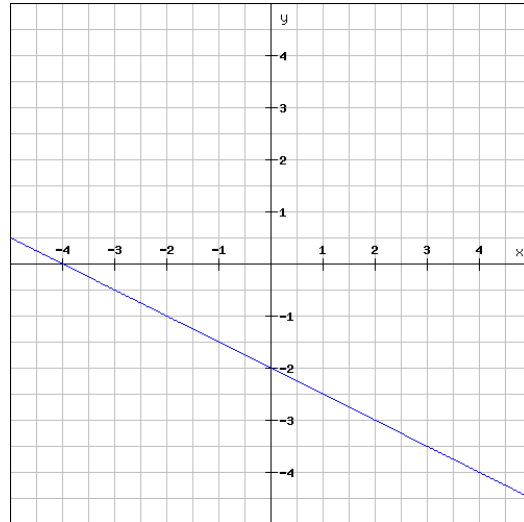
m = ____ b = ____ f(x) = ____



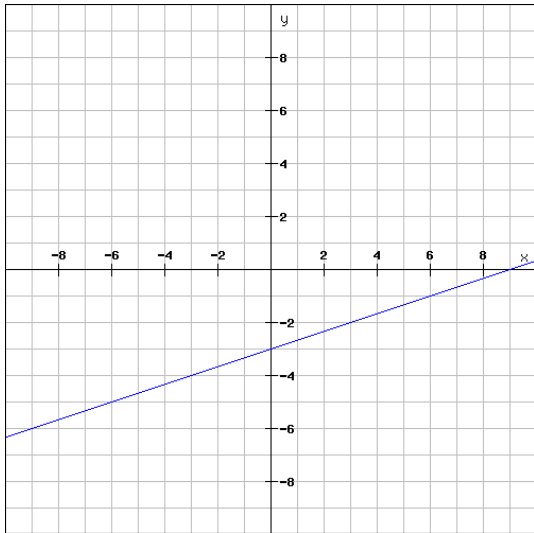
m = ____ b = ____ f(x) = ____



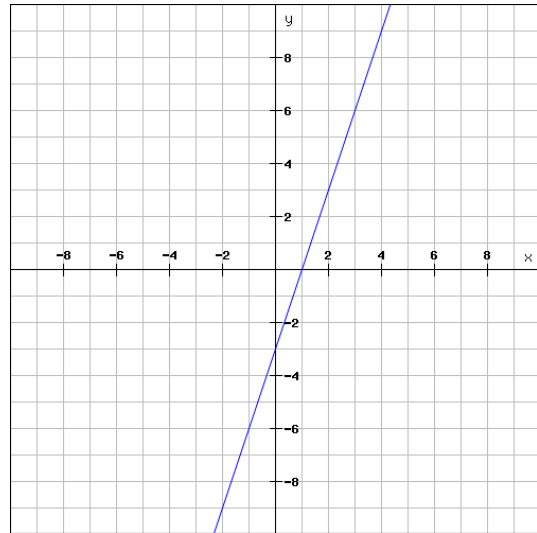
m = ____ b = ____ f(x) = ____



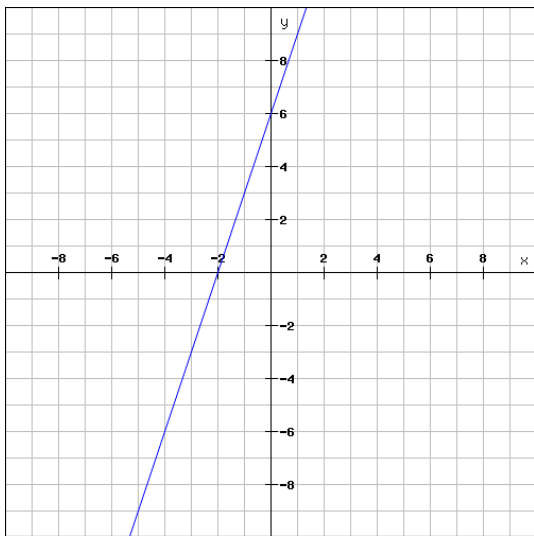
m = ____ b = ____ f(x) = ____



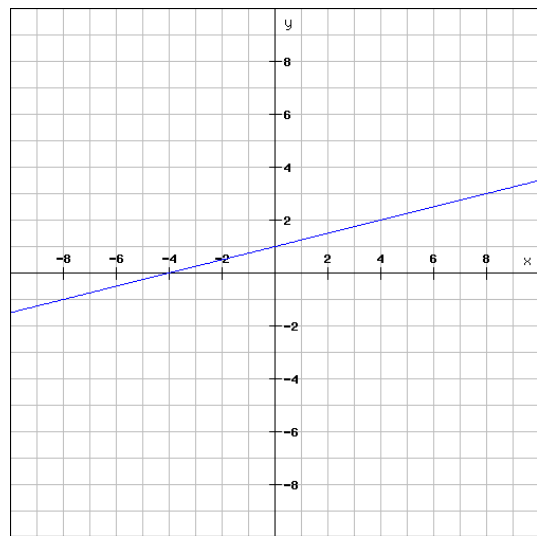
$m = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$ $f(x) = \underline{\hspace{2cm}}$



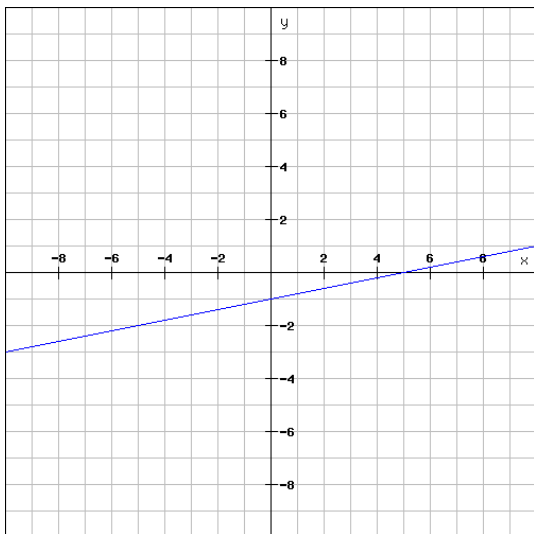
$m = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$ $f(x) = \underline{\hspace{2cm}}$



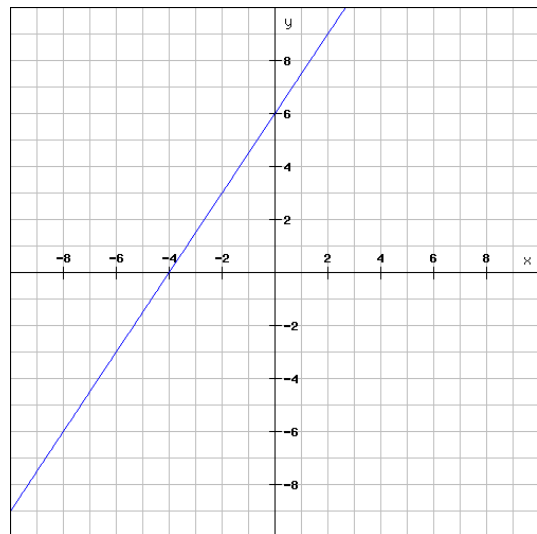
$m = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$ $f(x) = \underline{\hspace{2cm}}$



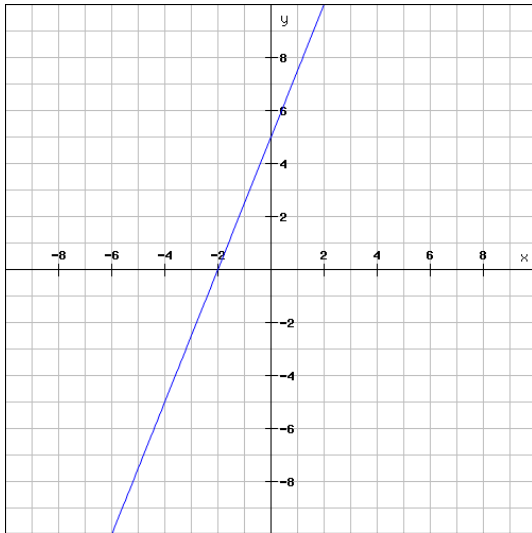
$m = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$ $f(x) = \underline{\hspace{2cm}}$



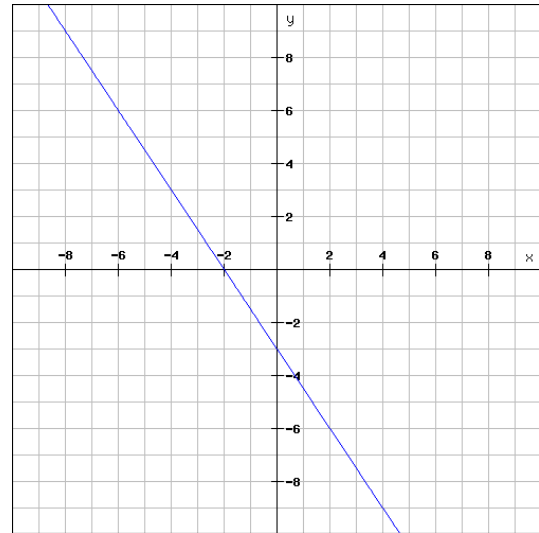
$m = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$ $f(x) = \underline{\hspace{2cm}}$



$m = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$ $f(x) = \underline{\hspace{2cm}}$



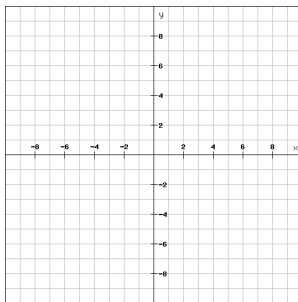
$m = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$ $f(x) = \underline{\hspace{2cm}}$



$m = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$ $f(x) = \underline{\hspace{2cm}}$

Analyze the following functions:

1. $f(x) = 1$



Domain: $\underline{\hspace{2cm}}$

Range: $\underline{\hspace{2cm}}$

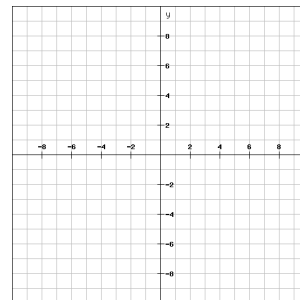
Increase: $\underline{\hspace{2cm}}$

Decrease: $\underline{\hspace{2cm}}$

y intercept: (,)

x intercept: (,)

4. $f(x) = 0$



Domain: $\underline{\hspace{2cm}}$

Range: $\underline{\hspace{2cm}}$

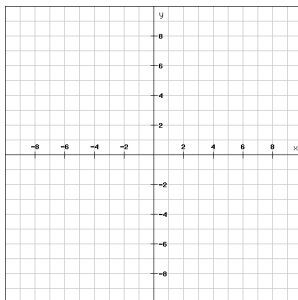
Increase: $\underline{\hspace{2cm}}$

Decrease: $\underline{\hspace{2cm}}$

y intercept: (,)

x intercept: (,)

2. $f(x) = 2$



Domain: $\underline{\hspace{2cm}}$

Range: $\underline{\hspace{2cm}}$

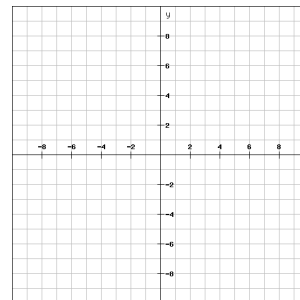
Increase: $\underline{\hspace{2cm}}$

Decrease: $\underline{\hspace{2cm}}$

y intercept: (,)

x intercept: (,)

5. $f(x) = x$



Domain: $\underline{\hspace{2cm}}$

Range: $\underline{\hspace{2cm}}$

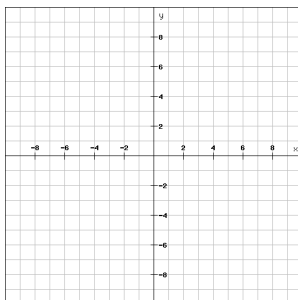
Increase: $\underline{\hspace{2cm}}$

Decrease: $\underline{\hspace{2cm}}$

y intercept: (,)

x intercept: (,)

3. $f(x) = -1$



Domain: $\underline{\hspace{2cm}}$

Range: $\underline{\hspace{2cm}}$

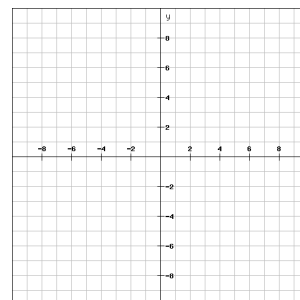
Increase: $\underline{\hspace{2cm}}$

Decrease: $\underline{\hspace{2cm}}$

y intercept: (,)

x intercept: (,)

6. $f(x) = x+1$



Domain: $\underline{\hspace{2cm}}$

Range: $\underline{\hspace{2cm}}$

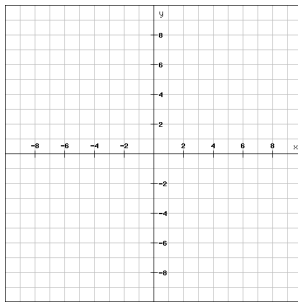
Increase: $\underline{\hspace{2cm}}$

Decrease: $\underline{\hspace{2cm}}$

y intercept: (,)

x intercept: (,)

7. $f(x) = -x$



Domain: _____

Range: _____

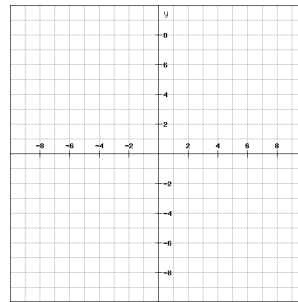
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

11. $f(x) = 3 - 2x$



Domain: _____

Range: _____

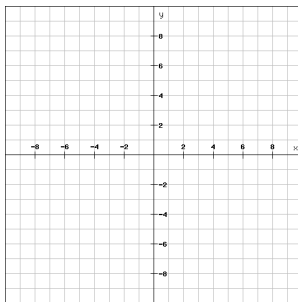
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

8. $f(x) = -x - 2$



Domain: _____

Range: _____

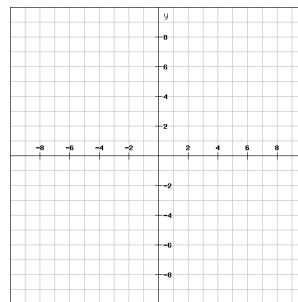
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

12. $f(x) = \frac{x}{3}$



Domain: _____

Range: _____

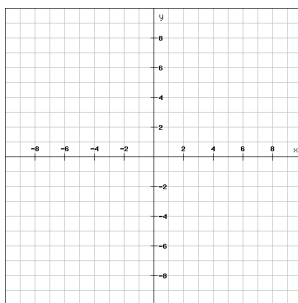
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

9. $f(x) = 2x$



Domain: _____

Range: _____

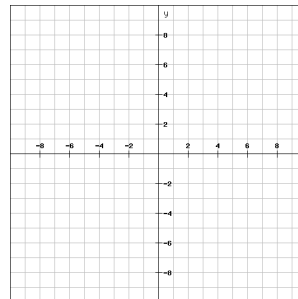
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

13. $f(x) = 2x + 1$



Domain: _____

Range: _____

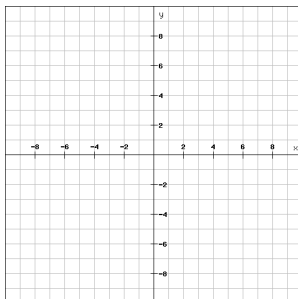
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

10. $f(x) = 3x - 5$



Domain: _____

Range: _____

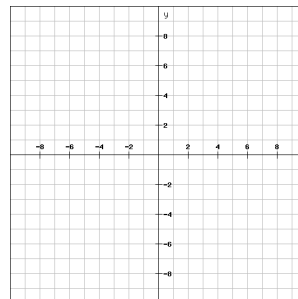
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

14. $f(x) = 2x - 2$



Domain: _____

Range: _____

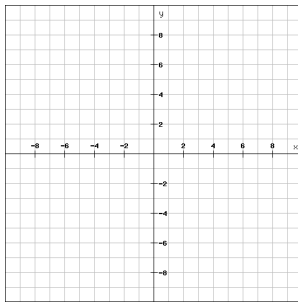
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

15. $f(x) = 3x + 5$



Domain: _____

Range: _____

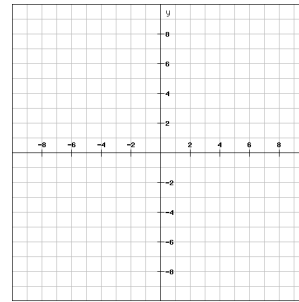
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

19. $f(x) = -\frac{3}{2}x - \frac{3}{2}$



Domain: _____

Range: _____

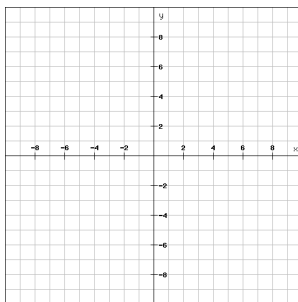
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

16. $f(x) = \frac{x}{2} - 5$



Domain: _____

Range: _____

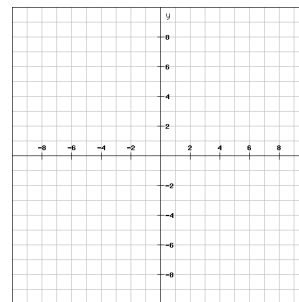
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

20. $f(x) = -\frac{1}{2}x - \frac{3}{2}$



Domain: _____

Range: _____

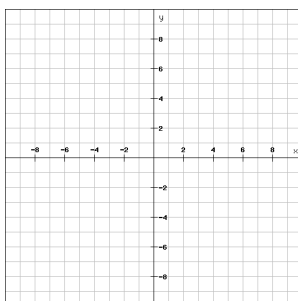
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

17. $f(x) = \frac{x}{4} + 6$



Domain: _____

Range: _____

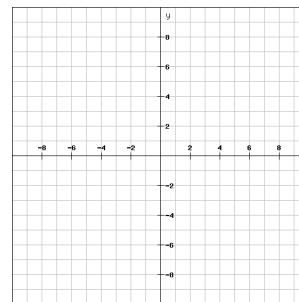
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

21. $f(x) = \frac{7}{2}x - \frac{1}{4}$



Domain: _____

Range: _____

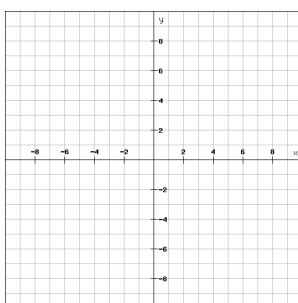
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

18. $f(x) = \frac{3}{2}x - 5$



Domain: _____

Range: _____

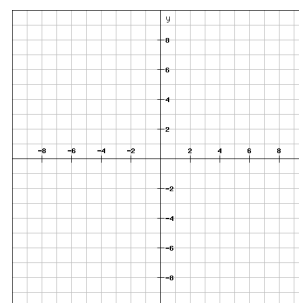
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

22. $f(x) = -\frac{9}{5}x + \frac{8}{3}$



Domain: _____

Range: _____

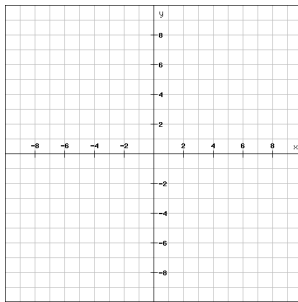
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

23. $3x + 2y = 2$



Domain: _____

Range: _____

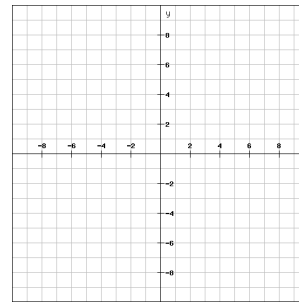
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

27. $y + 2x - 3 = 1$



Domain: _____

Range: _____

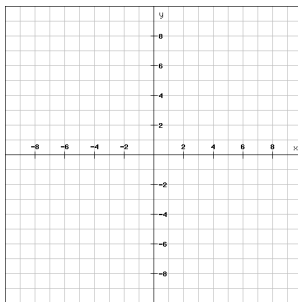
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

24. $4x - 2y - 3 = 1$



Domain: _____

Range: _____

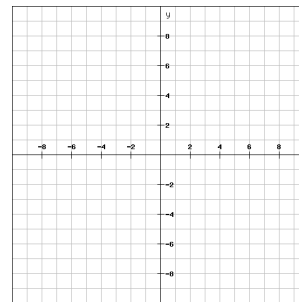
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

28. $5y + 5x = 5$



Domain: _____

Range: _____

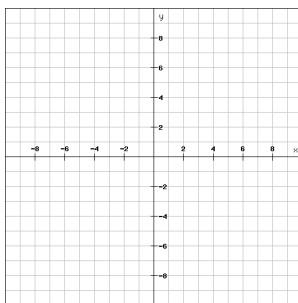
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

25. $-2y + 3x = -5$



Domain: _____

Range: _____

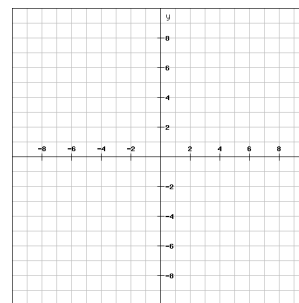
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

29. $2x - 2y - 3 = 1$



Domain: _____

Range: _____

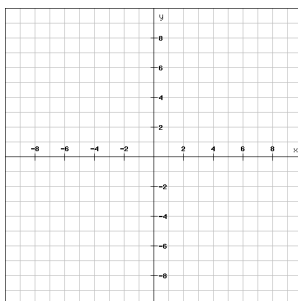
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

26. $y - x = 2$



Domain: _____

Range: _____

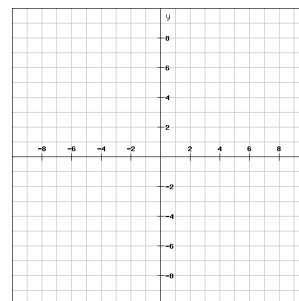
Increase: _____

Decrease: _____

y intercept: (,)

x intercept: (,)

30. $x - 2y - 150 = 0$



Domain: _____

Range: _____

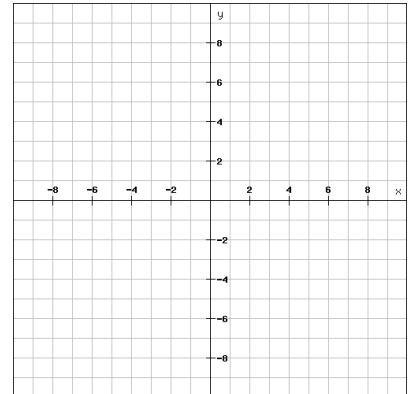
Increase: _____

Decrease: _____

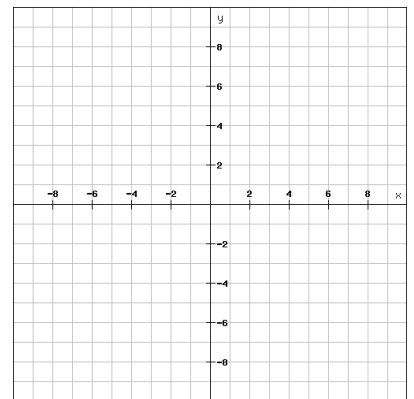
y intercept: (,)

x intercept: (,)

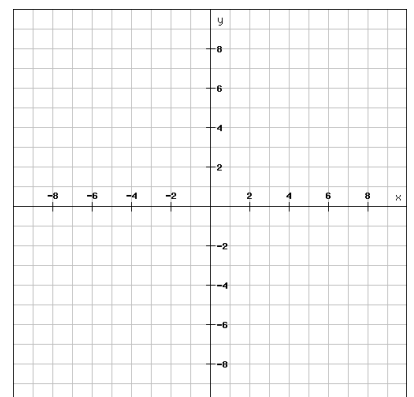
31. Write the equation of the line that has a slope of 2 and passes through the point (2, 4) in the forms: $y = mx + b$ and $ax + by + c = 0$, ($a, b \in \mathbb{Z}$)



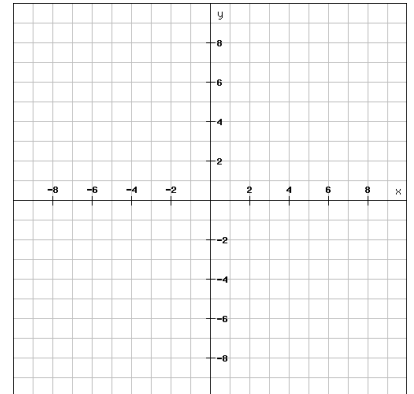
32. Write the equation of the line that has a slope of $-\frac{1}{2}$ and passes through the point $(-2, -3)$ in the forms: $y = mx + b$ and $ax + by + c = 0$, ($a, b \in \mathbb{Z}$)



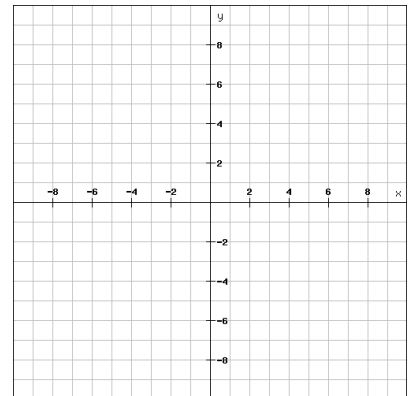
33. Write the equation of the line that has a slope of $-\frac{5}{2}$ and passes through the point $(-1, 2)$ in the forms: $y = mx + b$ and $ax + by + c = 0$, ($a, b \in \mathbb{Z}$)



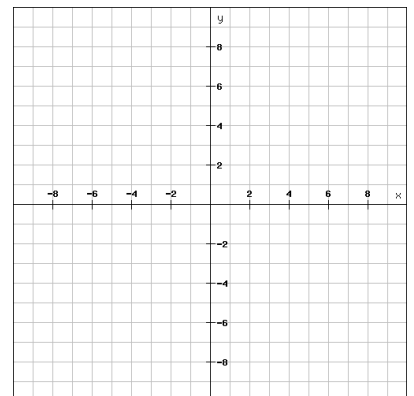
34. Find the equation of the line that passes through the points (1, 1), (2, 4),
indicate its y and x intercepts and sketch it. Write its equation in the forms: $y = mx + b$ and $ax + by + c = 0$, ($a, b \in \mathbb{Z}$)



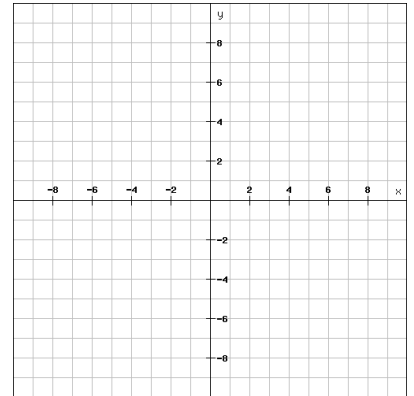
35. Find the equation of the line that passes through the points $(-1, -5)$, $(4, 3)$,
indicate its y and x intercepts and sketch it. Write its equation in the forms: $y = mx + b$ and $ax + by + c = 0$, ($a, b \in \mathbb{Z}$)



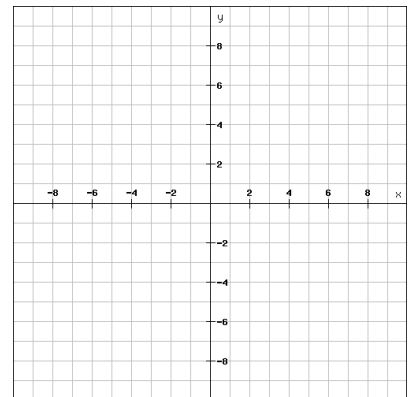
36. Find the equation of the line that passes through the points $(-5, 1)$, $(-2, 4)$,
indicate its y and x intercepts, sketch it and write it in both forms $y = mx + b$ and $ax + by + c = 0$, ($a, b \in \mathbb{Z}$)



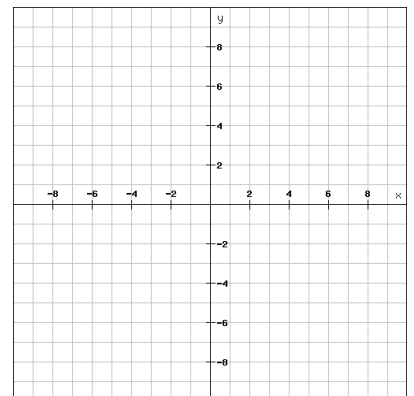
37. Write the equation of the line that is parallel to the line $y = 5x - 2$ and passes through the point $(-2, -1)$. Write its equation in the forms: $y = mx + b$ and $ax + by + c = 0$, ($a, b \in \mathbb{Z}$)



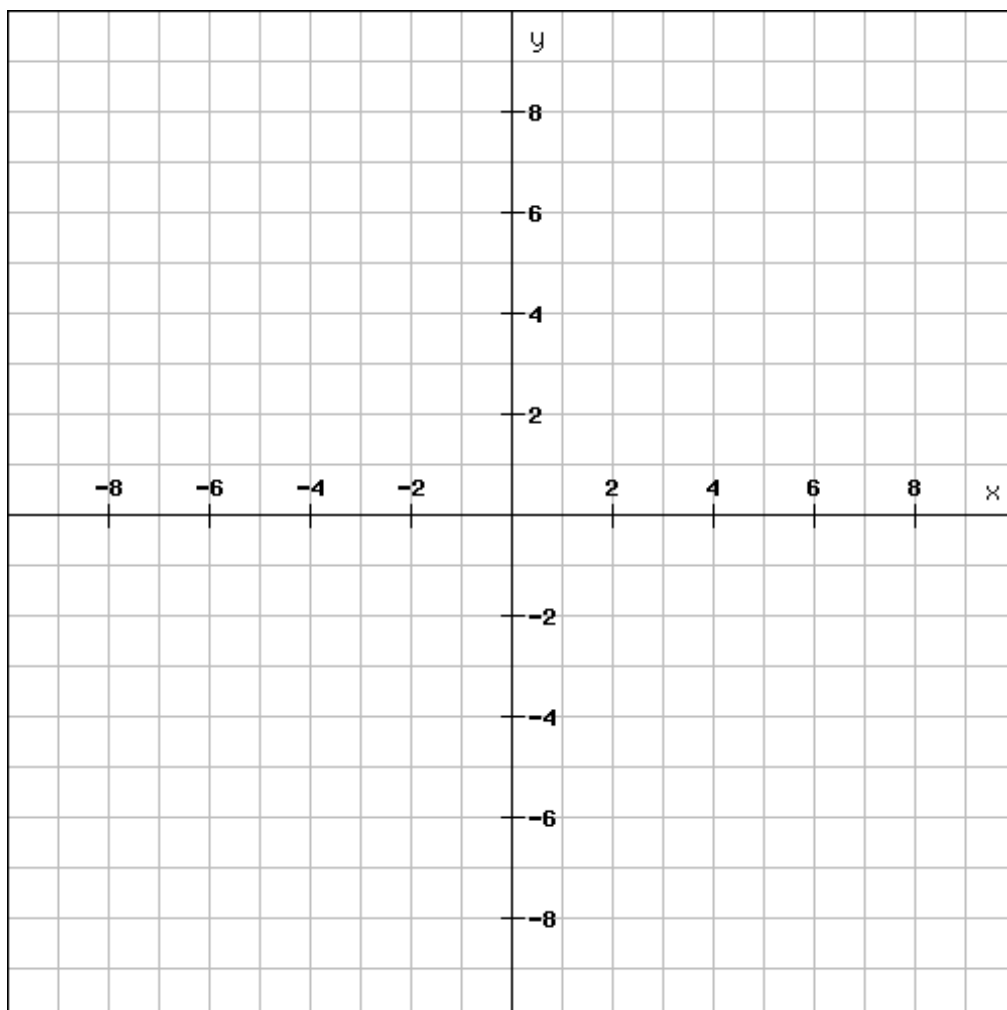
38. Write the equation of the line that is parallel to the line $y = -0.5x - 1$ and passes through the point $(-3, 6)$. Write its equation in the forms: $y = mx + b$ and $ax + by + c = 0$, ($a, b \in \mathbb{Z}$)



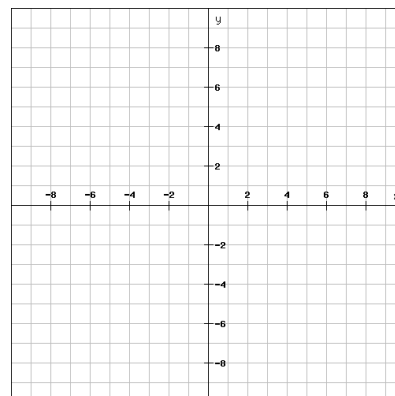
39. Sketch and write the equation of the line with a slope of $-\frac{1}{5}$ that passes through the point $(0, 2)$.



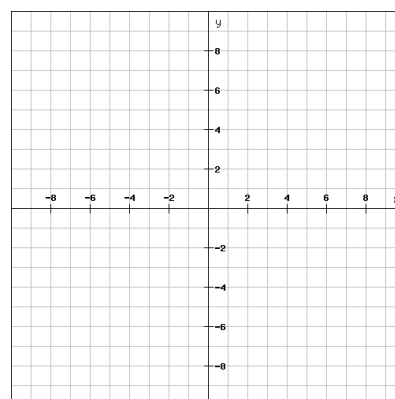
40. Sketch and write the equation of the lines with a slope: $1, 2, -3, -1, -\frac{1}{2}, -\frac{1}{3}$,
that pass through the point $(0,0)$.



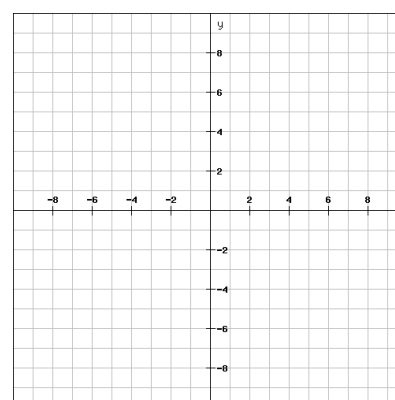
41. Sketch and write the equation of the line with a slope of -3 that passes through the point $(0,-3)$.



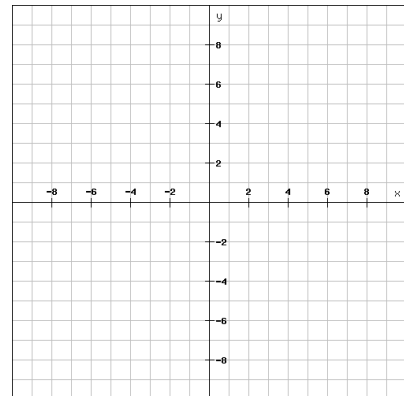
42. Sketch and write the equation of the line with a slope of 2 that passes through the point $(2,0)$



43. Sketch and write the equation of the line with a slope of $-\frac{1}{2}$ that passes through the point $(-2,0)$



44. Sketch and write the equation of the line with a slope of 2 that passes through the point $(-4, 2)$

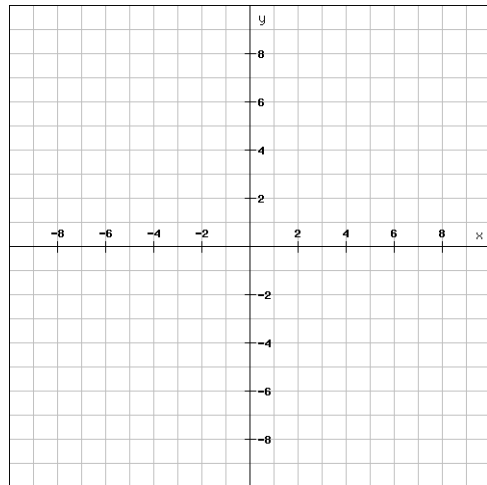


45. Find the intersection between the lines $f(x) = 2x - 3$ and $f(x) = -5x - 2$

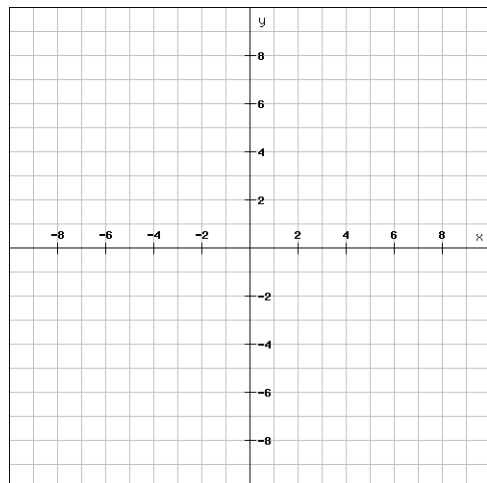
46. Find the intersection between the lines $f(x) = -12x - 13$ and $f(x) = 15x + 20$.

DISTANCE AND MIDPOINT BETWEEN 2 POINTS

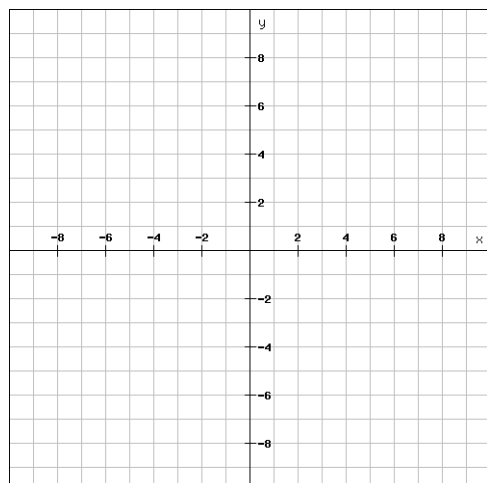
47. Given the points $(1, 2)$ and $(5, 8)$. Find the distance between them. Find the midpoint. Sketch to illustrate your answer.



48. Given the points $(-3, 2)$ and $(5, -6)$. Find the distance between them. Find the midpoint. Sketch to illustrate your answer.

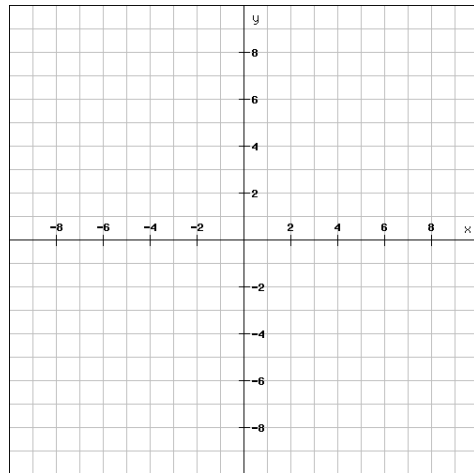


49. Given the points $(-1, -6)$ and $(-5, -1)$. Find the distance between them. Find the midpoint. Sketch to illustrate your answer.

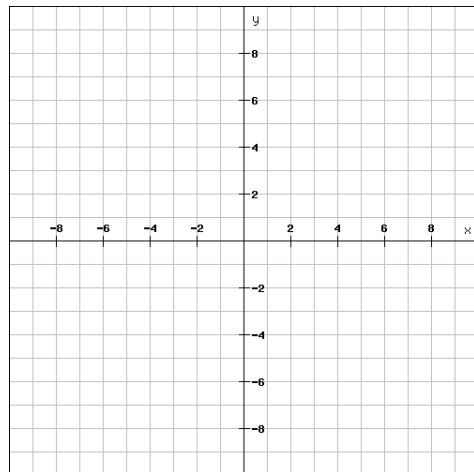


PERPENDICULAR LINES ($m \cdot m_{\perp} = -1$)

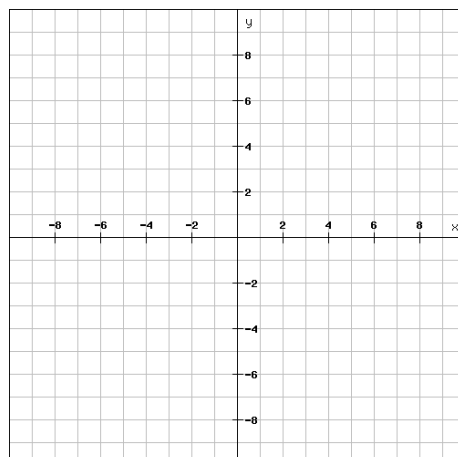
50. Find the equation of a line perpendicular to the line $y = 3x - 2$ that passes through the point $(3, 12)$. Sketch to illustrate your answer.



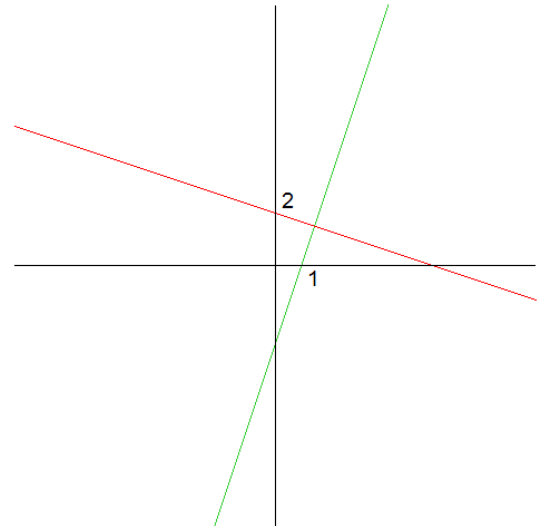
51. Find all the lines perpendicular to the line $y = -3x + 4$. Find the ones that pass through the point $(-3, 1)$. Sketch to illustrate your answer.



52. Find a line perpendicular to the line $y = -\frac{2}{5}x + 1$ that passes through the point $(-1, -7)$. Sketch to illustrate your answer.

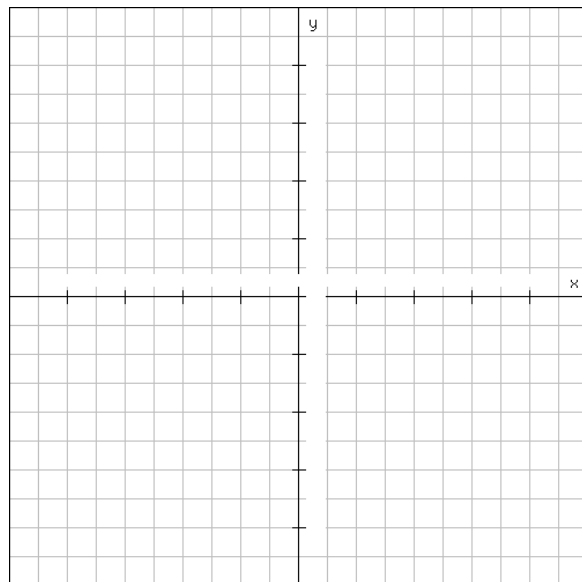


53. Given that the slope of one of the lines is 3 and that the lines are perpendicular, find the **exact** coordinates of the point of intersection of the two lines.



Application

1. The price of a new toy (in US\$) is $C(t) = 20 - 0.5t$, t given in days.
 - a. Sketch the corresponding graph.



- b. What was the initial price of the toy? _____
- c. Find the price of the toy after 10 days
- d. What is the domain of the function, argument the answer,
- e. What is the range of the function.
- f. What is the meaning of 0.5? Does it have units? What are they?

2. You need to rent a car for one day and to compare the charges of 3 different companies. Company I charges 20\$ per day with additional cost of 0.20\$ per mile. Company II charges 30\$ per day with additional cost of 0.10\$ per mile. Company III charges 60\$ per day with no additional mileage charge.
- Write the cost function for each one of the companies.
 - Sketch all 3 graphs on the same axes system.
 - Comment on the circumstances in which renting a car from each one of the companies is best.