

Linear Functions

Key Ideas:

1. Slopes

- **Label your points** $(x_1, y_1), (x_2, y_2)$
- $m = \frac{\text{rise}}{\text{run}}$, **(build a triangle)**
- **Slope Formula**
- **Rate of Change**
- **Parallel (same), Perpendicular (negative reciprocals – “flip and switch”)**

2. Graphing Linear Functions

- **Slope-Intercept Form** $(y = mx + b)$
- **Point-Slope Form** $(y - y_1 = m(x - x_1))$
- **Graph using Intercepts**

3. Forms of the Equation

- **Slope-Intercept form** $(y = mx + b)$
- **Slope-Point form** $(y - y_1 = m(x - x_1))$
- **General form (no fractions or decimals, and x is always positive),**
 $(Ax + By + C = 0)$

4. Writing Equations

- **Find the slope**
 - Use the slope formula**
 - Re-write the equation in slope-intercept form**
- **Find a point**
- **Substitute the slope and point into point-slope formula**
- **Re-write point-slope formula into general form or slope-intercept form if needed**

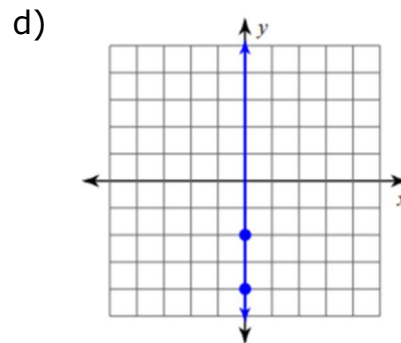
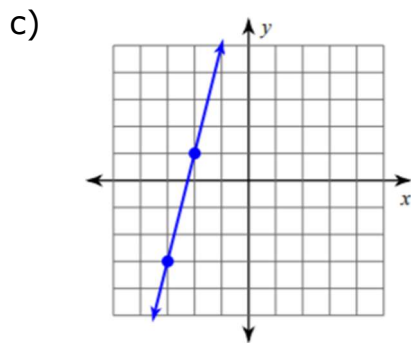
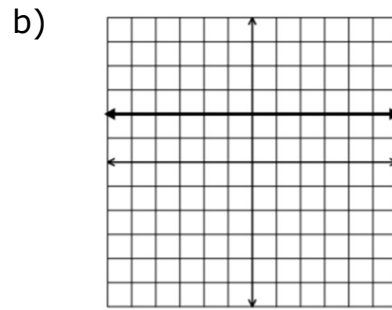
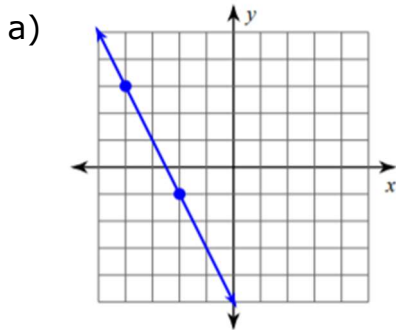
5. Distance and Midpoint

- **Label your points** $(x_1, y_1), (x_2, y_2)$
- **Use “Frank” to find the formulas**
- **Make sure the answer for the midpoint is written as a coordinate**

***Note: Substitute into formulas carefully! Watch your positive and negative signs!!**

Slope of a Line

1. Determine the slope of the line using Rise over Run (Build the triangle).



2. Determine the slope of a line through the following points.

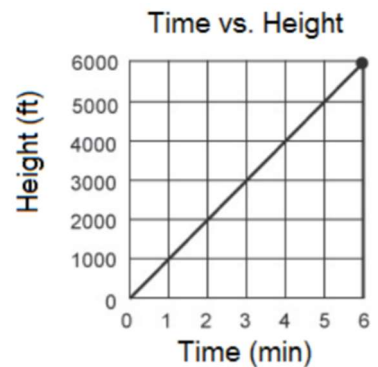
a) $(3, -7), (-5, -10)$

b) $(-3, 8), (-1, 3)$

3. Determine the value of " x " if the slope running through the points $(0, -2)$ and $(x, 4)$ has a value of 2.

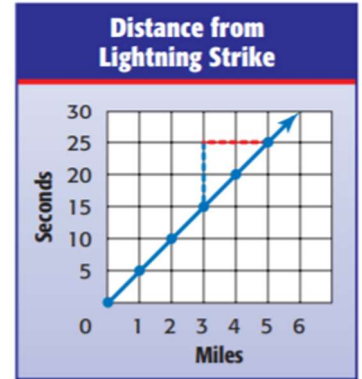
4. Determine the value of "y" if the slope running through the points $(6, y)$ and $(1, -5)$ is $-\frac{2}{3}$.
5. The coordinates of two points on two different lines are given. Are the two lines parallel, perpendicular, or neither? Justify your choice.
- a) $W(-3, 5), X(8, 3)$ and $C(6, 6), D(1, 8)$
- b) $J(3, -4), K(9, 2)$ and $P(5, -4), Q(2, -1)$
- c) $R(-3, 2), S(1, -6)$ and $E(-2, 1), F(-5, 7)$

6. Determine the slope of a line **parallel and perpendicular** to: $3x - 5y + 10 = 0$.
7. A line through the points $(5, y)$ and $(-6, -3)$ is perpendicular to a line with a slope of $\frac{1}{4}$. Determine the value of "y".
8. A line through the points $(-4, 1)$ and $(x, -2)$ is parallel to the line $5x - 3y + 10 = 0$. Determine the value of "x".
9. The following represents the graph for a helium balloon's flight.
- Determine the rate of change of the graph.
 - What does this slope (rate of change) mean?
 - When is the balloon at 5 000 ft?
 - How high is the balloon off the ground at 2 minutes?



10. The following graph represents the relationship between the number of seconds it takes to hear the thunder after a lightning strike and the distance you are from the lightning.

a) Determine the rate of change for the graph.



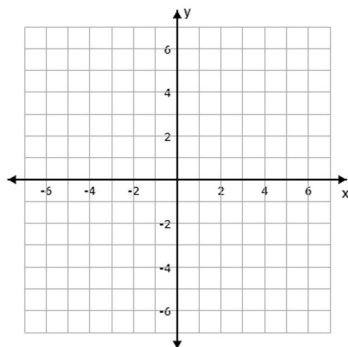
b) What does this rate of change mean?

c) Determine the number of miles you are from a lightning strike if the time between the strike and thunder was 15 seconds.

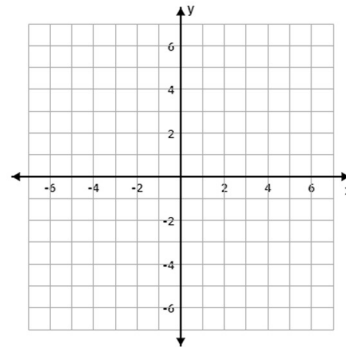
Graphing Linear Functions

11. Graph the following using the Slope-Intercept method for graphing.

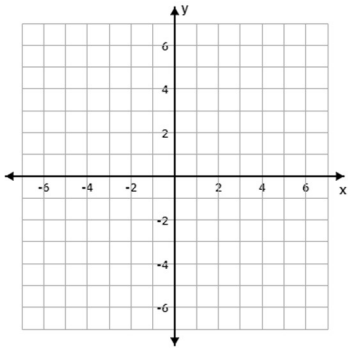
a) $-x + 2y = 4$



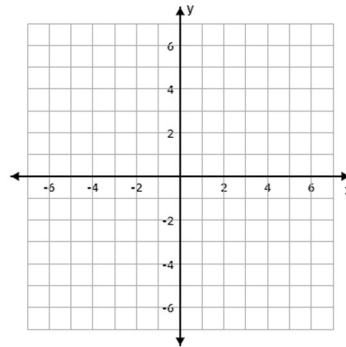
b) $4x - 3y = 12$



c) $y = -\frac{4}{5}x + 3$

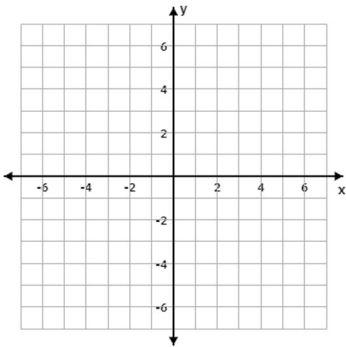


d) $-3x - 5y = 15$

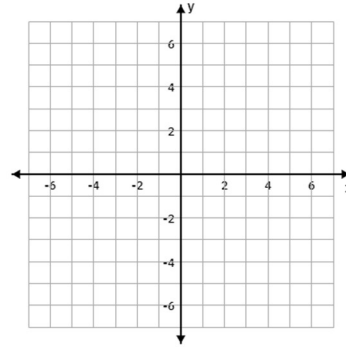


12. Graph the following using the Point-Slope method for graphing.

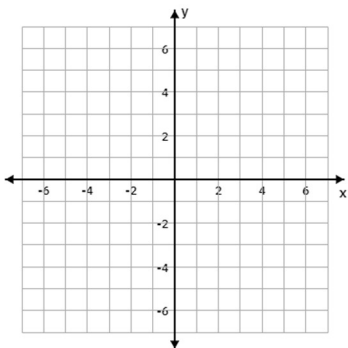
a) $y + 1 = \frac{2}{3}(x - 4)$



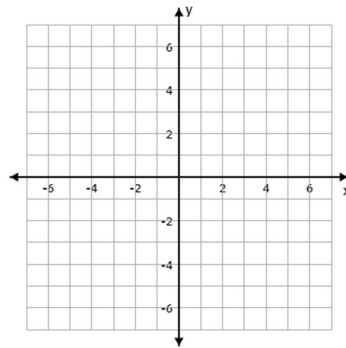
b) $y + 3 = -\frac{4}{3}x$



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

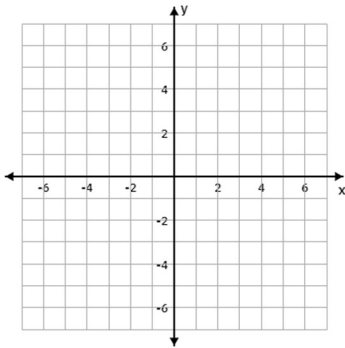


d) $y - 5 = -(x - 2)$

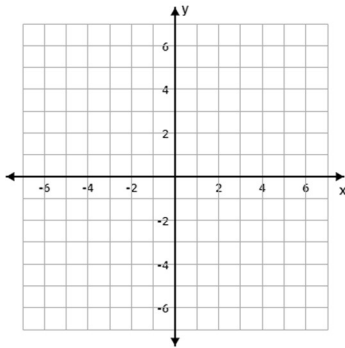


13. Graph the following by finding the intercepts of the graph.

a) $7x + y + 7 = 0$



b) $2x - 5y - 10 = 0$



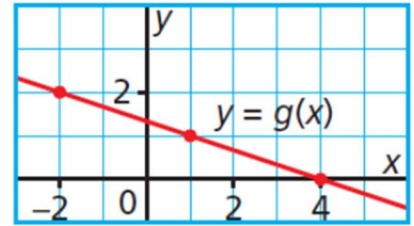
Writing Equations of Linear Functions

14. Write each equation in general form.

a) $y = \frac{5}{4}x - \frac{3}{5}$

b) $y + 4 = \frac{2}{3}(x - 1)$

15.a) Write an equation in slope-point form for this line.



b) Write the equation in part a) in slope-intercept form. What is the y -intercept of this line?

16. Write an equation for a line in **general form** having: **slope** of $-\frac{3}{5}$, **y -intercept** of -8 .

17. Write an equation for a line having: **slope** of 4, passing through $P(-2, 9)$.

18. Write an equation for a line in **slope-intercept form**: passing through $A(5, -1)$ and $B(-3, 4)$.

19. Write in **general form**: $y - 2 = \frac{-2}{3}(x + 6)$.

20. Write in **general form**: **parallel** to $5y = 3x - 1$, passing through $(8, -2)$.

21. Write in **general form**: **perpendicular** to $3x - 4y = 12$, passing through $(-4, 3)$.

Distance and Midpoint

22. Calculate the ***distance*** from $A(6, -4)$ to $B(1, 5)$:

23. Given $\triangle ABC$ with $A(0, -2)$, $B(4, 5)$, and $C(-2, 1)$.

a) Classify the triangle as scalene, isosceles or equilateral.

b) Determine the length of median AM , where M is the midpoint of BC .

24. Determine the **midpoint** of $A(-5, 3)$ and $B(-11, -7)$.

25. Determine the coordinates of A, given that $M(-1, 2)$ is the midpoint of AB and B has coordinates $(4, 7)$.

26. The endpoints of the diameter of a circle are $(-4, -2)$ and $(6, 4)$. Determine the coordinates of the centre of the circle.