

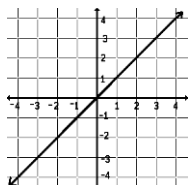
Unit 3 - Linear Functions - Algebra Review Sheet



Translating the Parent Function

Parent function: $y = x$

- the number after the x (the y -intercept) moves the function **UP** or **DOWN**
- the number before the x (the slope) makes the line **STEEPER** (bigger than 1) or **LESS STEEP** (less than 1)
- If the number before the x is **NEGATIVE**, the line will **DECREASE**



EX: $y = -2x + 1$ will move the parent function 1 unit up, make it steeper, and decrease

Slope-Intercept Form of a Line

$$y = mx + b$$

m = slope and b = y -intercept

Intercept

- x-intercept**: the point where the line crosses the x -axis (when $y = 0$)
- y-intercept**: the point where the line crosses the y -axis (when $x = 0$)

EX: $2x + 3y = 6$

The x -intercept is:

$$\begin{aligned} 2x + 3(0) &= 6 \\ 2x &= 6 \\ x &= 3 \end{aligned}$$

The y -intercept is:

$$\begin{aligned} 2(0) + 3y &= 6 \\ 3y &= 6 \\ y &= 2 \end{aligned}$$

Slope

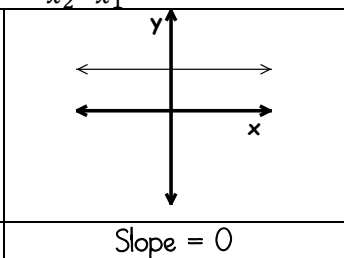
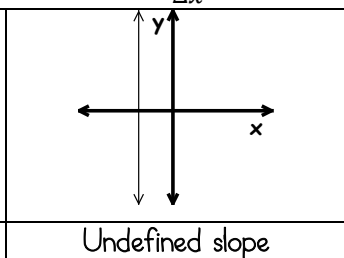
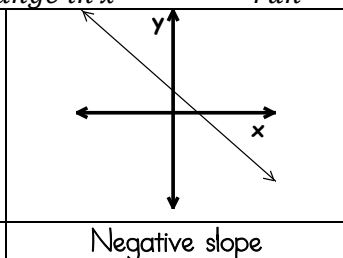
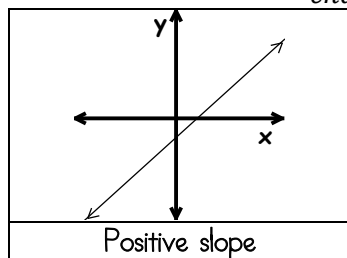
The steepness of a line

$$m = \frac{\text{change in } y}{\text{change in } x}$$

$$m = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{\Delta y}{\Delta x}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$



Steps to Graphing Lines

- Write in slope-intercept form
- identify the slope and y -intercept
- plot the y -intercept on the y -axis
- use the formula slope = $\frac{\text{rise}}{\text{run}}$ to generate more points (+ up or right, - down or left)

When graphing, make sure:

- To plot **at least** 3 points
- To connect your line with a **straightedge**
- To draw **arrows** on both ends of your line
- That your line **covers the entire graph**
- to label **quadrants**

Graphing Linear Inequalities

- Determine if the line is **solid** (\geq or \leq) or **dashed** ($>$ or $<$)
- Graph like you would a line
- Shade **above** the line if it is $>$ or \geq
- Shade **below** the line if it is $<$ or \leq

Interpreting Solutions

- a point **IS** a solution if: it is in the shaded area or if it is on a **SOLID** line
- a point **IS NOT** a solution if: it is **NOT** in the shaded area or if it is on a **DASHED** line

Arithmetic Sequences

$$a_n = a_1 + (n - 1)d$$

d is the common **difference**

a_1 is the **first** term in the sequence

a_n is the **n^{th}** term in the sequence

n is a positive integer

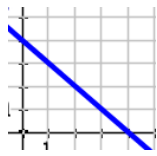
Is it a solution?

A point is a solution to a linear function if:

- It lies on the graph
- When it is substituted into the equation, it makes a **TRUE** statement
- If it appears in the table of values

EX: the point (1, 3) is a solution to:

$$y = -2x + 5$$



x	y
-2	5
0	1
2	-3
4	-7

Writing a line in slope-intercept form

- Is just like solving an equation only simpler
 1. Distribute
 2. Sort (move y terms to one side)
 3. Make sure it is in $y = mx + b$ form

EX:

$$4(x - 1) + 2y = 10 \quad \text{distribute}$$

$$4x - 4 + 2y = 10 \quad \text{sort}$$

$$2y = -4x + 4 + 10 \quad \text{combine like terms}$$

$$2y = -4x + 14$$

divide by 2 to get y alone

$$y = -2x + 7$$

Solve a Linear System

Graphically

1. Graph & label both equations
2. Find where the 2 lines intersect
3. Label point of intersection with coordinates
4. Interpret solution in context

Substitution

1. Solve for a variable (either x or y)
2. Substitute
3. Solve for the remaining variable
4. **Substitute** your new value back into one of the equations then solve to get the other variable
5. Circle your final answer
6. Check using substitution

Elimination

1. Sort to line up the variables and equal signs
2. Multiply one or both equations to create the additive inverse of one of the variables
3. Add or subtract both equations to **eliminate** one of the variables (the one that has the additive inverse)
4. Solve for the variable that remains
5. **Substitute** your new value back into one of the equations (it doesn't matter which one so pick the easier one) then solve to get the other variable
6. Circle your final answer
7. Check using substitution

Linear Regressions on the TI-Nspire

1. TYPE YOUR DATA INTO LISTS

- HOME → 1 New Document → 4: Add Lists and Spreadsheets
- Enter your data into 2 columns
- Never type in the "=" line!
- Label your data at the top

2. CREATE A SCATTERPLOT

- CTRL → doc(+ page) → 5: Add Data and Statistics
- Use your mouse pad to click on the "CLICK TO ADD VARIABLE" ON EACH AXIS and choose the appropriate variable for each axis. Your data will move into a scatter plot.

3. SHOW LINE OF BEST FIT

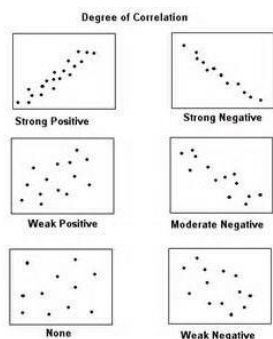
- On the graph page:
- menu → 4: Analyze → 6: Regression → 1: Show Linear (mx + b)
- It should label the line with its equation ☺

4. FIND A LINEAR REGRESSION

- CTRL → doc(+ page) → 1: Add Calculator
- menu → 6: Statistics → 1: Stat Calculations → 3: Linear Regression (mx + b)
- add variables to x list and y list then press OK
- m is the slope
- b is the y-intercept
- r is the correlation coefficient
- resid is residuals

Correlation Coefficient

- r
- How well the line fits the data
- Between -1 (- slope) and 1 (+ slope)
- The stronger the correlation, the closer r is to -1 or 1



Solve a Linear Inequality System

1. Graph and label both inequalities
2. Find where the shaded regions overlap and label S
3. Solutions are on solid lines in the overlapping region