Review of linear equations in two variables in one page

1. **Given equation, graph line**
   - Find 2 solutions (preferably 3). Plot them in the xy-plane.
   - Graph the line through the points. NOTE: If the 3 points are not aligned, one or more of your solutions is wrong. Check your work.

2. **Given equation, find slope and intercepts.**
   - Solve for y in the equation. Write the equation as $y = mx + b$.
   - Then the slope is m and the y-intercept is b.

3. **Given equation, find slope x- and y-intercepts.**
   - To find the x-intercept, substitute $y = 0$ in the equation and solve for x. What you get is the x-intercept.
   - To find the y-intercept, substitute $x = 0$ in the equation and solve for y. What you get is the y-intercept.

4. **Given graph, find slope and y-intercept.**
   - Pick two points on the line, say (x_1, y_1) and x_2, y_2). Then slope $= \dfrac{y_2 - y_1}{x_2 - x_1}$.
   - You can also count 'how many up or down' and divide it by 'how many left or right' as you go from a point to the other. Remember left is '$-$', right is '$+$', down is '$-$', up is '$+$'.
   - The y-intercept is the point where the line touches the y-axis.
   - The x-intercept is the point where the line touches the x-axis.

5. **Given slope and a point (or y-intercept), draw the graph.**
   - If the slope is, say, $\frac{p}{q}$, starting at the given point (or at the y-intercept if it is given)
     - Go p units up (or down if p is negative)
     - Then go q units right (or left if q is negative).

     The point you get is another point on the line. Graph the line through the two points.
   - Remember that if slope is a whole number, say p, you need to write the slope as $\frac{p}{1}$. Also, if it is negative, put the '$-$' sign on the numerator OR on the denominator (not both).

6. **Given slope and y-intercept, find equation of the line with that slope and y-intercept.**
   - The equation is $y = mx + b$, where the slope is m and the y-intercept is b.

7. **Given slope and point, find equation of the line with that slope through the given point.**
   - The equation is $y - y_1 = m(x - x_1)$, where the slope is m and the point is (x_1, y_1).

8. **Given two points, find equation of the line through the two points.**
   - Find slope using $m = \dfrac{y_2 - y_1}{x_2 - x_1}$, where (x_1, y_1) and x_2, y_2) are the coordinates of the two points.
   - The equation is $y - y_1 = m(x - x_1)$

9. **Given a point and parallel line, find equation.**
   - If two lines are parallel, they have the same slope.
   - Find the slope m of the given line and use $y - y_1 = m(x - x_1)$, where (x_1, y_1) are the coordinates of the given point.

10. **Given a point and a perpendicular line, find equation.**
    - If two lines are perpendicular, their slopes are the negative reciprocal of each other.
    - Find the slope m_1 of the given line.
    - The slope of the line you want to find is $m_2 = -1/m_1$. Then use $y - y_1 = m_2(x - x_1)$, where (x_1, y_1) are the coordinates of the given point.