Solutions for homework on equations of lines
Mr. Neeman, 10A. November 7, 2011

#1. For each of the following, find the line's equation, express it in both forms ($y = mx + c$ and $ax + by = c$) if possible, find the intersections with the axes, and sketch it in a diagram.

(a) L_a: a line with gradient 2, passing through $(1, -2)$.
$y = 2x + b$
$-2 = 2(1) + b$
$-4 = b$
So $y = 2x - 4$
Intersection with y axis: When $x = 0$, $y = -4$.
Intersection with x axis: When $y = 0$, $x = 2$.

(b) L_b: a line with gradient $-\frac{1}{3}$, passing through $(6, 3)$.
$y = -\frac{1}{3}x + b$
$3 = -\frac{1}{3}(6) + b$
$5 = b$
So $y = -\frac{1}{3}x + 5$
Intersection with y axis: When $x = 0$, $y = 5$.
Intersection with x axis: When $y = 0$, $x = 15$.

(c) L_c: a line passing through $(3, 0)$ and $(-1, -6)$
$m = \dfrac{-6 - 0}{-1 - 3} = \dfrac{-6}{-4} = \dfrac{3}{2}$
$y = \frac{3}{2}x + b$
$0 = \frac{3}{2}(3) + b$
$-\frac{9}{2} = b$
So $y = \frac{3}{2}x - \frac{9}{2}$
Intersection with y axis: When $x = 0$, $y = -\frac{9}{2}$.
Intersection with x axis: When $y = 0$, $x = 3$.

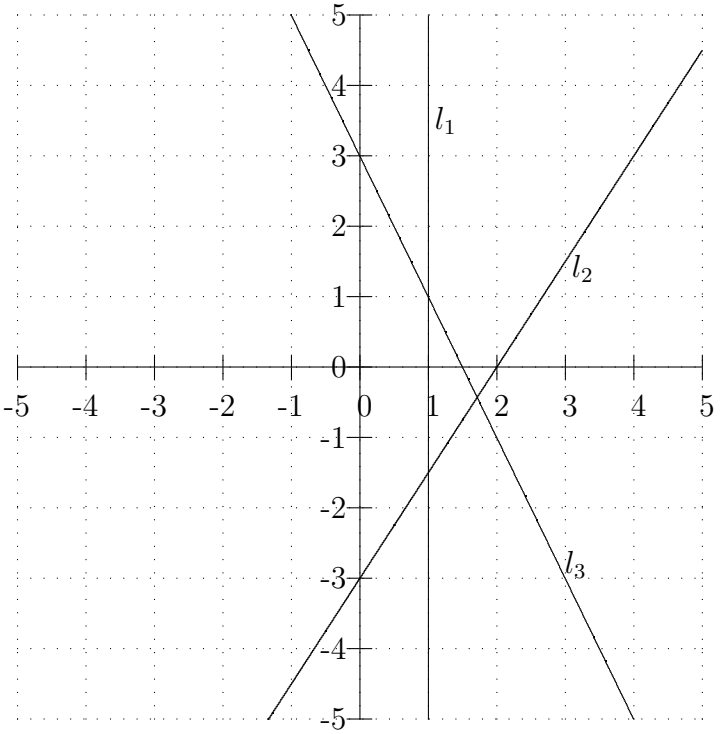
(d) L_d: a line passing through $(3, -1)$ and $(3, 3)$
Using the formula for the gradient would give a division by zero, because it's a vertical line:
$x = 3$
There is no intersection with the y axis.
Intersection with x axis: when $x = 3$.

The diagram are straightforward, given the intersections with the axes.

#2. Consider the line with equation $y = 2x - 5$. For each of the following points, check whether it lies on the line or not.
(a) $(1, 2)$
$2 = 2(1) - 5$
$0 = -5$, this is false, so the point isn't on the line.
(b) $(-2, -9)$
$-9 = 2(-2) - 5$
$-9 = -9$, this is true, so the point is on the line.

(c) $(3, -1)$
$-1 = 2(3) - 5$
$-1 = 1$, this is false, so the point isn't on the line.

#3. Find the equations of the lines shown in the following diagram. Express each one in both forms, if possible.



l_1 is $x = 1$

l_2 has gradient $m = \dfrac{0 - (-3)}{2 - 0} = \dfrac{3}{2}$, and $b = -3$ since that's where it intersects the y axis. So it's:
$y = \frac{3}{2}x - 3$, which can also be turned into:
$3x - 2y = 6$

l_3 has gradient $m = \dfrac{1 - 3}{1 - 0} = -2$, and $b = 3$. So it's:
$y = -2x + 3$, which can also be turned into:
$2x + y = 3$