MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECTION 2.1 **Math 1090** FALL 2009

SOLUTIONS

1. (a) We have

$$\begin{aligned}
\frac{3}{2}x - \frac{1}{3} &= \frac{5}{6} \\
\frac{3}{2}x &= \frac{5}{6} + \frac{1}{3} \\
&= \frac{7}{6} \\
x &= \frac{7}{6} \cdot \frac{2}{3} \\
&= \frac{7}{9}.
\end{aligned}$$

(b) We have

$$\begin{aligned}
x - 1 &= 1 - x \\
x + x &= 1 + 1 \\
2x &= 2 \\
x &= 1.
\end{aligned}$$

(c) We begin by multiplying out each side. We have

$$\begin{aligned}
\frac{1}{4}(x-6) &= -\frac{1}{2}(2x+3) \\
\frac{1}{4}x - \frac{3}{2} &= -x - \frac{3}{2} \\
\frac{1}{4}x + x &= -\frac{3}{2} + \frac{3}{2} \\
\frac{5}{4}x &= 0 \\
x &= 0 \cdot \frac{4}{5} = 0.
\end{aligned}$$

(d) Again, we must first multiply out each side. Be careful to properly distribute the subtraction on the lefthand side:

$$-5(x-1) = -5x - (-5) \cdot 1 = -5x + 5.$$

Now we have

$$\begin{aligned}1-5(x-1) &= 3(x+4)-2x\\ 1-5x+5 &= 3x+12-2x\\ 6-5x &= x+12\\ -5x-x &= 12-6\\ -6x &= 6\\ x &= -1.\end{aligned}$$

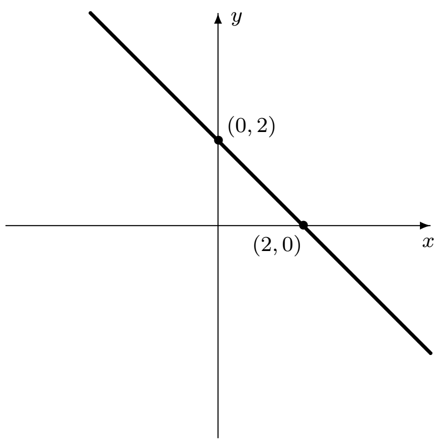
2. (a) We can write this function as

$$f(x) = -x+2,$$

so immediately we know that its slope $m=-1$, and $b=2$ so its y-intercept is the point $(0,2)$. To find the x-intercept, we solve

$$\begin{aligned}2-x &= 0\\ 2 &= x,\end{aligned}$$

and therefore the point $(2,0)$ is the x-intercept. Now we can sketch the graph.



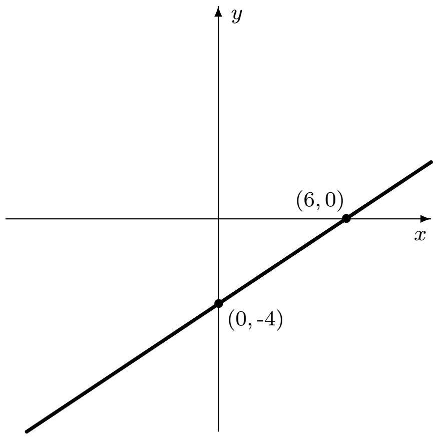
(b) First we rewrite the equation in slope-intercept form by solving for y. We have

$$\begin{aligned}2x-3y-12 &= 0\\ -3y &= -2x+12\\ y &= \frac{2}{3}x-4.\end{aligned}$$

Hence the slope of the line is $m=\dfrac{2}{3}$ and, since $b=-4$, the y-intercept is $(0,-4)$. Now we set

$$\frac{2}{3}x - 4 = 0$$
$$\frac{2}{3}x = 4$$
$$x = 4 \cdot \frac{3}{2} = 6,$$

and see that $(6, 0)$ is the x-intercept. Finally, we can sketch the graph.



3. (a) Since the line is horizontal, all points on the line have the same y-coordinate. Hence an equation of the line is $y = -5$. (This can also be seen from point-slope or slope-intercept form by setting $m = 0$.)

   (b) Using slope-intercept form, we have

$$y = 4x + b$$
$$-5 = 4\left(\frac{1}{2}\right) + b$$
$$-5 = 2 + b$$
$$-7 = b$$

   so an equation of the line is

$$y = 4x - 7.$$

4. The slope of the line is

$$m = \frac{-6 - 3}{2 - (-1)} = \frac{-6 - 3}{2 + 1} = \frac{-9}{3} = -3.$$

   Using point-slope form with the point $(2, -6)$, then, an equation of the line is

$$y - (-6) = -3(x - 2)$$
$$y + 6 = -3x + 6$$
$$y = -3x.$$

5. (a) We can write the equation of the line ℓ_0 in slope-intercept form as

$$\begin{aligned} 3x + 2y &= -1 \\ 2y &= -3x - 1 \\ y &= -\frac{3}{2}x - \frac{1}{2} \end{aligned}$$

so the slope of ℓ_0 is $-\frac{3}{2}$. Since the desired line ℓ should be parallel to ℓ_0, it must have the same slope, namely $m = -\frac{3}{2}$. Then slope-intercept form gives

$$\begin{aligned} y &= -\frac{3}{2}x + b \\ 5 &= -\frac{3}{2}(-6) + b \\ 5 &= 9 + b \\ -4 &= b \end{aligned}$$

and so an equation of ℓ is

$$y = -\frac{3}{2}x - 4.$$

(b) Since the desired line ℓ should now be perpendicular to ℓ_0, its slope must be

$$m = -\frac{1}{-\frac{3}{2}} = \frac{2}{3}.$$

Again using slope-intercept form, we obtain

$$\begin{aligned} y &= \frac{2}{3}x + b \\ 5 &= \frac{2}{3}(-6) + b \\ 5 &= -4 + b \\ 9 &= b \end{aligned}$$

and so an equation of ℓ is

$$y = \frac{2}{3}x + 9.$$