

## Problem Set 2 - Solutions

2019 Math Boot Camp for the Political and Social Sciences

### Some practice

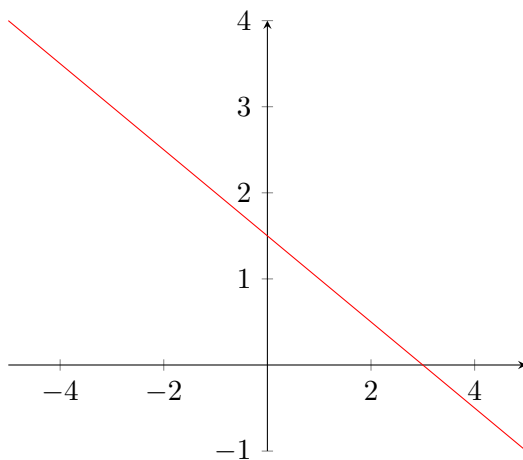
1.  $f(1) = 3 \times 1 + 5 = 8$ ,  $f(-3) = 3 \times -3 + 5 = -4$ ,  $f(0.7) = 3 \times 0.7 + 5 = 7.1$ .

2.  $f \circ g(x) = (2x + 2)^2 - 1$ .

(a)  $f \circ g(4) = (2 \times 4 + 2)^2 - 1 = 10^2 - 1 = 99$ .

(b)  $g(4) = 2 \times 4 + 2 = 10$ . Then  $f(10) = 10^2 - 1 = 99$ .

3.



4. Plug  $y = 2x + 1$  into  $x - 3y = 7$  to get

$$x - 3(2x + 1) = 7$$

$$-5x - 3 = 7$$

$$x = -2$$

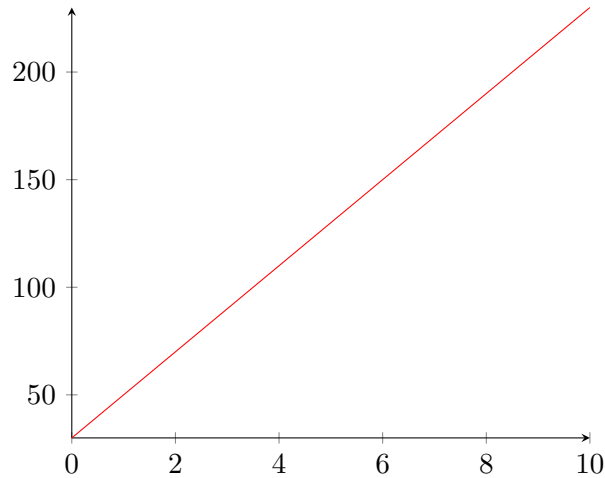
Thus  $y = 2 \times -2 + 1 = -3$  and thus the intersection is  $(-2, -3)$ .

5. (a)  $m = \frac{110 - 90}{4 - 3} = 20$ , so  $H = 20t + c$ . Then

$$90 = 20 \times 3 + c$$

$$30 = c$$

(b)



(c) When Jimmy is  $t = 5$  he would be  $H = 20 \times 5 + 30 = 130\text{cm}$  tall. When Jimmy is  $t = 10$  he would be  $H = 20 \times 10 + 30 = 230\text{cm}$  tall.

(d) When Jimmy would be  $H = 800\text{cm}$  tall, he'd be

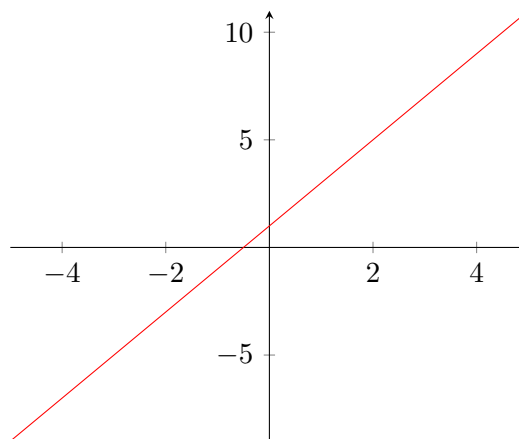
$$800 = 20 \times t + 30$$

$$770 = 20 \times t$$

$$t = 38.5\text{years old}$$

## Deeper Thinking

1. There are  $(3 \text{ possibilities for where 1 goes}) \times (3 \text{ possibilities for where 2 goes}) = 9$  functions from  $A$  to  $B$ . To count in general find out how many choices you have for each input.
2. Drawing a triangle we see using some trigonometry that the angle  $\theta$  between the graph and the axis satisfies  $\tan(\theta) = \frac{\text{rise}}{\text{run}}$ . Thus  $\theta = \tan^{-1}(m)$ .
3. These points form the following picture



Thus the graph is  $y = 2x + 1$ .