Loughborough University

Week 4: The Straight Line and Linear Equations

Solutions

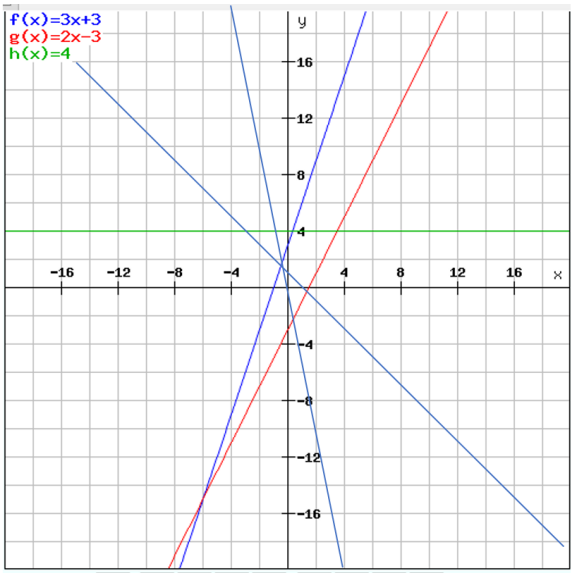
1. State the vertical intercept and the gradient of each of the following lines:

   Solution:

   (a) $y = 3x + 3$ Intercept = 3, grad = 3
   (b) $y = 2x - 3$ Intercept = -3, grad = 2
   (c) $y = 4$ Intercept = 4, grad = 0
   (d) $y = 1 - x$ Intercept = 1, grad = -1
   (e) $y = -5x$ Intercept = 0, grad = -5

2. Sketch the lines from question 1. Which has the steepest gradient? Where do lines a. and c. intersect?

   Solution: Steepest gradient is line e (gradient = -5), steepest positive gradient is line a (gradient = 3). Lines a. and b. intersect where 3x+3=2x-3 i.e. at (-6, -15).



3. Which of these are straight lines?

   Solution:

   (a) $2x + 3y = 4$ Yes
   (b) $y = 3x^2 + 5$ No
   (c) $4xy + 2 = 5$ No
   (d) $x = 3$ Yes
   (e) $x + y = 1.2$ Yes
   (f) $x^2 - y^2 = 2$ No

4. What is the gradient of the straight line through (1,2) and (3,5)?
   Solution: $\frac{3}{2} = 1.5$
5. What is the equation of the straight line in question 4?
   Solution: $y = \frac{3}{2}x + \frac{1}{2}$
6. What is the distance between the points in question 4?
   Solution: $d = \sqrt{2^2 + 3^2} = \sqrt{13} = 3.61$
7. Solve these equations:
   (a) $3x + 4 = 4x + 3$
   (b) $5m - 3 = 5(m - 3) + 2m$
   (c) $\frac{5}{m} = \frac{2}{m+1}$
   (d) $\frac{4x+5}{6} - \frac{2x-1}{3} = x$

   Solution:
   (a) $x = 1$
   (b) $m = 6$
   (c) $m = -\frac{5}{3} = -1\frac{2}{3} = -1.667$
   (d) $x = 7/6 = 11/6 = 1.167$
8. If $a = 2$, find b if $54 = a - 4b$
   Solution: $b = -13$