151 Linear Mathematics **Review 1**

1. The straight line goes through the points (-3, 2) and (4, -1). Find the slope of the line.
According to the formula $m=\frac{y_2-y_1}{x_2-x_1}$ we have $m=\frac{-1-2}{4-(-3)}=\frac{-3}{7}$.

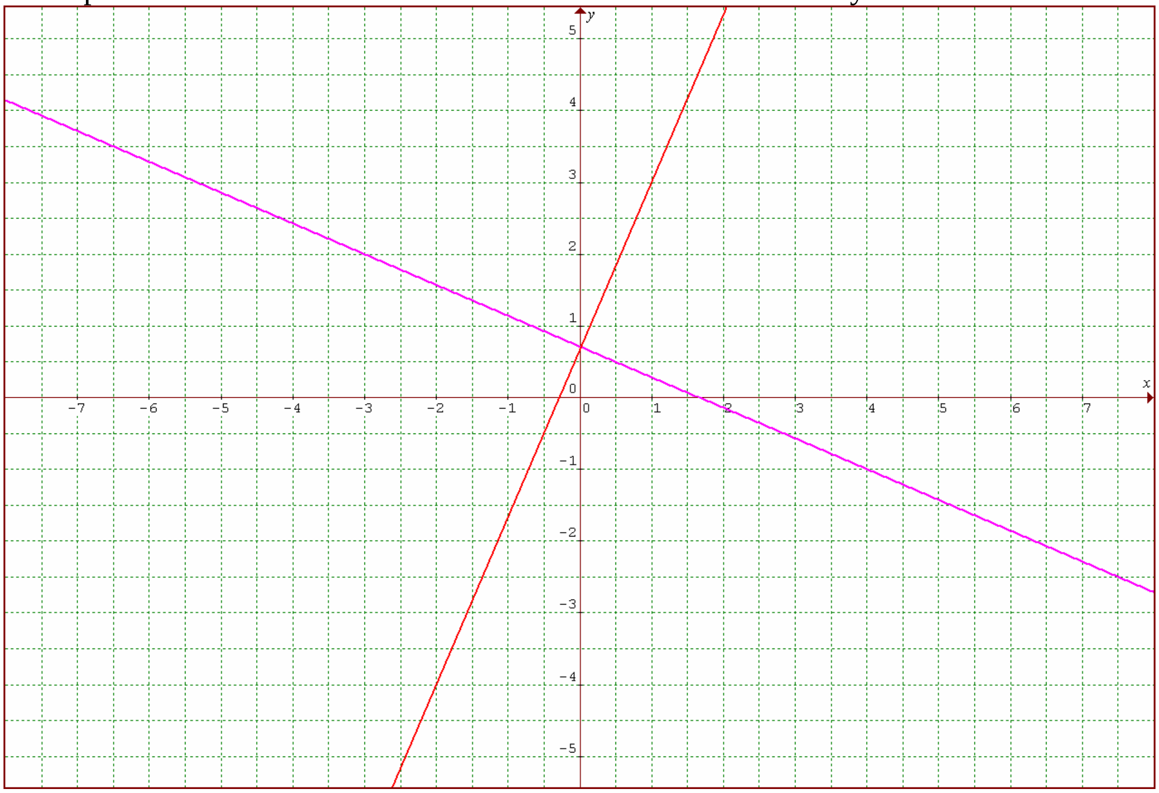
2. Write a point-slope equation for the line from Problem 1.
If we know the slope *m* and a point (a,b) on the straight line we can write an equation in the point-slope form as $y-b=m(x-a)$. If we use e.g. the point (-3,2) then we can write $y-2=-\frac{3}{7}[x-(-3)]$ or $y-2=-\frac{3}{7}(x+3)$.

3. Write the slope-intercept equation for the line from Problem 1.
We will solve the equation we got in the previous problem for *y*.
$y=-\frac{3}{7}(x+3)+2=-\frac{3}{7}x-\frac{9}{7}+\frac{14}{7}=-\frac{3}{7}x+\frac{5}{7}$.

4. Write an equation of the line parallel to the line from Problem 1 and going through the point (1,3).
Parallel lines have equal slopes and therefore we can write an equation of this parallel line in the point-slope form $y-3=-\frac{3}{7}(x-1)$. Solving for *y* we get an equation in the slope-intercept form $y=-\frac{3}{7}x+\frac{3}{7}+3=-\frac{3}{7}x+\frac{24}{7}$.

5. Write an equation of the line perpendicular to the line from Problem 1 and going through the point (1,3).
The slopes of perpendicular lines are negative reciprocals ($m_1m_2=-1$) and therefore the slope of the perpendicular line is $\frac{7}{3}$ and its equation in the point-slope form is $y-3=\frac{7}{3}(x-1)$. Solving for *y* we get an equation in the slope-intercept form $y=\frac{7}{3}x-\frac{7}{3}+3=\frac{7}{3}x+\frac{2}{3}$.

6. Graph the lines from Problems 1 and 5 in the same coordinate system.



7. Find the point of intersection of the lines from Problems 1 and 5.
We have to solve the system of equations

$$y = -\frac{3}{7}x + \frac{5}{7}$$

$$y = \frac{7}{3}x + \frac{2}{3}$$

Because the left parts are equal so are the right parts.

$-\frac{3}{7}x + \frac{5}{7} = \frac{7}{3}x + \frac{2}{3}$. Multiplying both parts by the common denominator, 21, we get $-9x + 15 = 49x + 14$, or $-58x = -1$ and $x = \frac{1}{58}$. After we plug this value of x into the firs equation we get $y = -\frac{3}{7} \times \frac{1}{58} + \frac{5}{7} = \frac{287}{406} \approx .7$

8. The straight line has the x-intercept -2 and the y-intercept 3. Write an equation of the line. We use the formula $\frac{x}{a} + \frac{y}{b} = 1$ where a and b are the x-intercept and the y-intercept, respectively. In our case $\frac{x}{-2} + \frac{y}{3} = 1$ or $2y - 3x = 6$.

9. If the price of a CD-player is $40 the demand is 4000. If the price of the same CD- player is $60 the demand is 3000. Assuming that the demand is a linear function of the price find the demand if the price is $55.

First we need the slope-intercept equation of the line through the points (40, 4000) and (60, 3000). The slope of the line is $m = \frac{3000-4000}{60-40} = \frac{-1000}{20} = -50$. Using for example the first point we can write an equation of the line in the point-slope form $d - 4000 = -50(p - 40)$. From here, $d = -50p + 6000$. If $p = 55$ then $d = -50 \times 55 + 6000 = 3250$.

10. A small company produces dolls. The permanent monthly expenses are $6000 and the Cost of producing a doll is $3. If the dolls sell for $10 each what is the breakeven point?

The cost of producing x dolls is $C(x) = 3x + 6000$. The corresponding revenue is $R(x) = 10x$. To find the break-even point we have to solve the equation $R(x) = C(x)$, or $10x = 3x + 6000$. We have $7x = 6000$ or $x = 6000/7 \approx 857$..