Solutions for Practice of Section 1.3

1. Given the points P (-2,5) and Q(4,-3) write an equation of the line containing P and Q in slope intercept form.

a) Determine the midpoint of the segment PQ.

b) Write an equation of a line parallel to PQ through the point (0,0)

c) Write an equation of a line perpendicular to PQ through the point (-2,5)

d) Determine the x and y intercepts of PQ.

2. On the first day of the month, Jonas had $850 in his bank account. On the 17^{th} he had $300 with no new deposits. Write an equation which represents the balance (b) in the account as a function of the day of the month(t). Assume he spends fairly steadily. State the slope and tell what it means. State the y-intercept and tell what it means. State the x-intercept and give it meaning. How much did he have on the 10^{th} day? When did he have about $500?

1. Given the points P (-2,5) and Q(4,-3) write an equation of the line containing P and Q in slope intercept form.

a) Determine the midpoint of the segment PQ.

b) Write an equation of a line parallel to PQ through the point (0,0)

c) Write an equation of a line perpendicular to PQ through the point (-2,5)

d) Determine the x and y intercepts of PQ.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3-5}{4-(-2)} = \frac{-8}{6} = -\frac{4}{3}$$

$y = mx + b$

$y = -\frac{4}{3}x + b$

We need to find b. Since point P lies on this line its coordinates satisfy this equation. By substituting those for x and y, we will obtain an equation with one unknown: b, which we can then easily solve:

$$5 = -\frac{4}{3}\cdot(-2) + b$$

$$5 = \frac{8}{3} + b$$

$$b = 5 - \frac{8}{3} = \frac{15-8}{3} = \frac{7}{3}$$

$$\boxed{y = -\frac{4}{3}x + \frac{7}{3}}$$

We can check whether we got a correct answer by checking if Q lies on this line:

$$y = -\frac{4}{3}\cdot 4 + \frac{7}{3} = -\frac{16+7}{3} = -\frac{9}{3} = -3$$

(4: x-coordinate of Q; -3: y-coordinate of Q)

so the point Q does lie on this line

a) Midpoint: $\left(\frac{-2+4}{2}, \frac{5+(-3)}{2}\right) = \left(\frac{2}{2}, \frac{2}{2}\right) = (1,1)$

b) A line parallel to PQ will have the same slope. We need to know its y-intercept, which we are in fact given: 0.

$$\boxed{y = -\frac{4}{3}x}$$

c) Line perpendicular to PQ will have slope opposite reciprocal, so it is 3/4. Since we know a point through which this perpendicular passes we can use point slope equation of a line:

$$y - 5 = \frac{3}{4}(x-(-2)) \Rightarrow y = \frac{3}{4}x + \frac{3}{2} + 5 \Rightarrow \boxed{y = \frac{3}{4}x + \frac{13}{2}}$$

d) y-intercept of PQ is easy to read off: $\boxed{(0, 7/3)}$ x-intercept we find by finding the point on the line whose y-coordinate is 0:

$$0 = -\frac{4}{3}x + \frac{7}{3} \Rightarrow \frac{4}{3}x = \frac{7}{3} \;/\cdot\frac{3}{4} \Rightarrow x = \frac{7}{4}$$

$$\boxed{\left(\frac{7}{4}, 0\right)}$$

2. On the first day of the month, Jonas had $850 in his bank account. On the 17th he had $300 with no new deposits. Write an equation which represents the balance (b) in the account as a function of the day of the month(t). Assume he spends fairly steadily. State the slope and tell what it means. State the y-intercept and tell what it means. State the x-intercept and give it meaning. How much did he have on the 10th day? When did he have about $500?

(1, 850)
(17, 300)

$$m=\frac{300-850}{17-1}=\frac{-550}{16}=-34.375$$

$y=-34.375x+b$
$850=-34.375*1+b \ /+34.375$
$884.375=b$

$$\boxed{y=-34.375x+884.375}$$

The slope is -34.375, and it means that Jonas' bank account balance decreases by $34.375 every day.
The y-intercept is $884.375 and it is amount of money Jonas has coming into this month. One way of thinking about it is that it was amount of money he had on the last day of the previous month.
The x-intercept is going to be found by solving: $0=-34.375x+884.375$, and we get $x=\frac{884.375}{34.375}$ $=25.72$ which tells us that Jonas' account will have less than $34.375 on the 25th of the month, and will have nothing on the 26th.
To find the amount of money on the 10th day, we will substitute 10 for x, and find the corresponding y:
$y=-34.375*10+884.375=-343.75+884.375=540.625$

To find when he had about $500 we will substitute 500 for y, and find its x. Or we can notice that on 10th day he had about $540, so on 11th day he'll have about $506, and on 12th he'll have $472, so the answer would be on the 11th day.