College Algebra — Joysheet 2
MAT 140, Spring 2018 — D. Ivanšić

Name: Saul Ocean
Covers: 1.3, 1.4 *Show all your work!*

1. (10pts) Find the equation of the line (in form $y = mx + b$) which has x-intercept 4 and is parallel to the line $3x - 2y = 8$. Draw both lines.

Given line:

$3x - 2y = 8$

$-2y = -3x + 8 \quad | \div(-2)$

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

has slope $\frac{3}{2}$ -

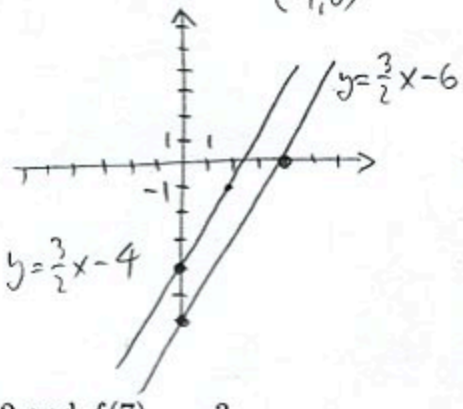
parallel line has same slope

Parallel line:

$y - 0 = \frac{3}{2}(x - 4)$

$y = \frac{3}{2}x - 6$

(4,0)



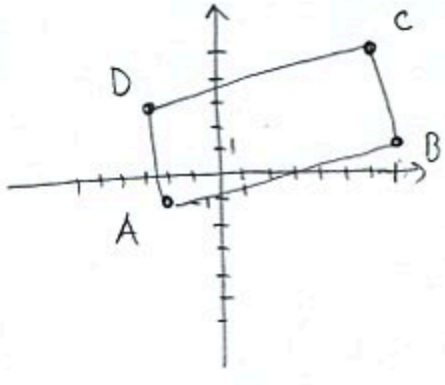
2. (4pts) Find the linear function f its y-intercept is -2 and $f(7) = -3$.

(0,-2)

Slope $= m = \frac{-3-(-2)}{7-0} = -\frac{1}{7}$

$y = -\frac{1}{7}x - 2, \quad f(x) = -\frac{1}{7}x - 2$

3. (10pts) Draw the quadrangle with vertices $A = (-2, -1)$, $B = (7, 1)$, $C = (6, 5)$ and $D = (-3, 3)$. Use slopes to algebraically determine if any two sides of this quadrangle are parallel or perpendicular.



$m_{AB} = \frac{1-(-1)}{7-(-2)} = \frac{2}{9}$

$m_{BC} = \frac{5-1}{6-7} = \frac{4}{-1} = -4$

$m_{CD} = \frac{3-5}{-3-6} = \frac{-2}{-9} = \frac{2}{9}$

$m_{AD} = \frac{3-(-1)}{-3-(-2)} = \frac{4}{-1} = -4$

AB and CD are parallel

BC and AD are parallel

because they have equal slopes

No two are perpendicular since no two slopes are opposite reciprocal.

4. (4pts) The recorded number of births in the U.S. has declined slightly since its recent peak in 2007. In 2007, 4,316,233 babies were born; in 2016, 3,945,875 were born. What is the average rate of change of the number of babies born from 2007 to 2016? What are the units for the average rate of change?

$\frac{3,945,875 - 4,316,233}{2016 - 2007} = \frac{370,358}{9} = -41,150.88889$ babies per year

5. (12pts) The water bill for a family was \$52.31 in a month when it used 9 HCF (hundred cubic feet) of water. In another month, it used 13 HCF and was billed \$64.59.
a) Assuming that the water cost $C(x)$ is a linear function of the amount of water x used (in HCF), write a formula for $C(x)$.
b) What is the cost if no water is used during a month? What is the meaning of this number?
c) What is the meaning of the slope in this example?

a) $(9, 52.31), (13, 64.59)$

$m = \frac{64.59 - 52.31}{13 - 9} = \frac{12.28}{4} = 3.07$

$y - 52.31 = 3.07(x - 9)$

$y = 3.07x - 27.63 + 52.31$

$C(x) = 3.07x + 24.68$

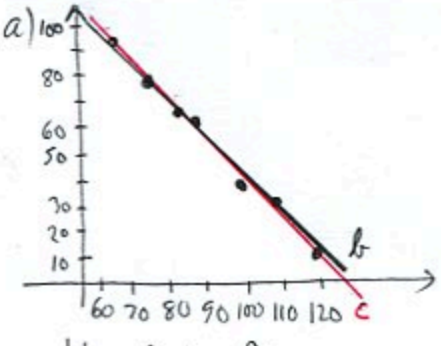
b) $C(0) = 24.68$
Flat monthly fee

c) slope $= 3.07$
is price per hundred cubic feet

6. (20pts) A store is trying to establish the relationship between the price P of a line of shoes they sell and the weekly sales S of those shoes. In the table, P is the price of a pair of shoes in dollars and S is the number of pairs of shoes sold weekly when the price is as given. Solve the problems below with accuracy 6 decimal points.
a) Draw the scatterplot of the data. Does the relationship look linear?
b) Use two points in the scatterplot to get an equation of a line that models the relationship between P and S. Draw the line on the graph.
c) Use your calculator to find the "line of best fit" for the data. Draw the line on the graph.
d) Find the coefficient of correlation r. How strong is the linear relationship between P and S?
e) What sales can the store expect if the they price the shoes at \$94?

P	S
69	93
79	77
84	66
89	65
99	37
109	33
119	13

a)



Yes, looks linear

b) Use points $(79, 77)$ and $(109, 33)$

$m = \frac{33 - 77}{109 - 79} = \frac{-44}{30} =$

$y - 77 = -\frac{44}{30}(x - 79)$ $y = -\frac{44}{30}x + 192.866667$

c) $y = -1.585992x + 201.674708$

d) $r = -0.988992$, close to -1 so very strong

e) $-1.585992 \cdot 94 + 201.674708 = 52.59144$
(plug in 94 in c)