College Algebra — Joysheet 3
MAT 140, Fall 2019 — D. Ivanšić

Name: Saul Ocean

Covers: 1.3, 1.4 *Show all your work!*

1. (10pts) Find the equation of the line (in form $y = mx + b$) passing through $(-1, -3)$ and is perpendicular to the line $4x - 3y = 1$. Draw both lines.

$4x - 3y = 1$

$-3y = -4x + 1 \quad / \div -3$

$y = \frac{4}{3}x - \frac{1}{3}$

slope $= \frac{4}{3}$

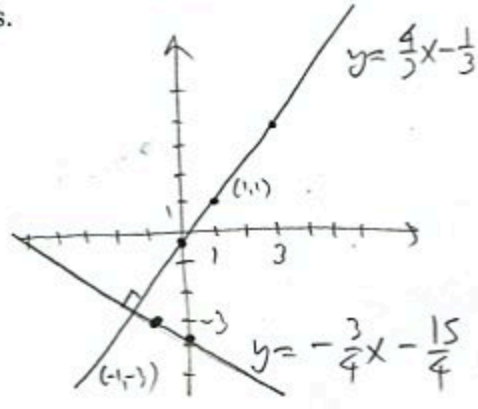
slope of perp. line $= -\frac{3}{4}$

Eq. of perp. line:

$y - (-3) = -\frac{3}{4}(x - (-1))$

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

$y = -\frac{3}{4}x - \frac{15}{4}$



2. (6pts) Find the linear function f if $f(-2) = 4$ and $f(3) = 7$. Draw the graph of the function.

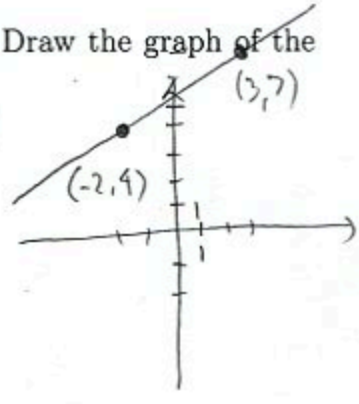
Need line through points $(-2, 4)$ and $(3, 7)$

$m = \frac{7-4}{3-(-2)} = \frac{3}{5}$

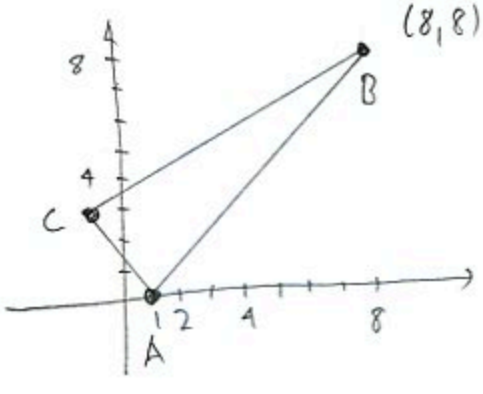
$y - 4 = \frac{3}{5}(x - (-2))$

$y - 4 = \frac{3}{5}x + \frac{6}{5}$

$y = \frac{3}{5}x + \frac{26}{5}$



3. (8pts) Draw the triangle with vertices $A = (1, 0)$, $B = (8, 8)$ and $C = (-1, 3)$. Use slopes to algebraically determine if this triangle is right.



slopes: $m_{AB} = \frac{8-0}{8-1} = \frac{8}{7}$

$m_{BC} = \frac{3-8}{-1-8} = \frac{-5}{-9} = \frac{5}{9}$

$m_{AC} = \frac{3-0}{-1-1} = \frac{3}{-2} = -\frac{3}{2}$

No two are opposite reciprocal, so no two sides are perpendicular. Not a right triangle

4. (4pts) According to the census, the population of Calloway county was 34,177 in 2000, and 37,191 in 2010. What is the average rate of change of the population from 2000 to 2010? What are the units for the average rate of change?

avg rate of change $= \frac{37191 - 34177}{2010 - 2000} = \frac{3,014}{10} = 301.40$ people per year

On average, Calloway county grew by 301 people per year.

5. (12pts) The electric bill for a family was \$117.52 in a month when it used 849 kWh (kilowatt-hours) of power. In another month, it used 1174 kWh and was billed \$156.52.
a) Assuming that the electricity cost $C(x)$ is a linear function of the amount of power x used (in kWh), write a formula for $C(x)$.
b) What is the cost if no electricity is used during a month? What is the meaning of this number?
c) What is the meaning of the slope in this example?

a) (849, 117.52) (1174, 156.52) Need line through these two points

$m = \frac{156.52 - 117.52}{1174 - 849} = \frac{39}{325} = 0.12$

$y - 117.52 = 0.12(x - 849)$

$y = 0.12x - 101.88 + 117.52$

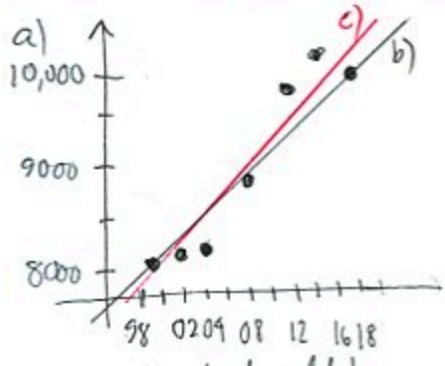
$y = 0.12x + 15.64 = C(x)$

b) $C(0) = 15.64$
This is the flat monthly fee.

c) 0.12 is cost per additional kilowatt-hour

6. (20pts) A university is trying to establish the relationship between the year t and the enrollment of students E during year t. In the table, E is the number of students enrolled and t is the year. 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 E and t. 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 E and t?
e) What enrollment can the university expect in year 2021?

P	S
1999	8,097
2002	8,120
2004	8,166
2008	8,914
2011	9,920
2015	10,304
2018	10,078



Not exactly, but could be.

b) Use (1999, 8097) and (2018, 10,078)

$m = \frac{10,078 - 8097}{2018 - 1999} = \frac{1981}{19} = 104.263158$

$y - 8097 = 104.26(x - 1999)$

$y = 104.263158x - 200,325.0526$

c) $y = 135.205305x - 262425.9951$

d) $r = 0.995280$ Pretty strong lin. rel.

e) $135.205305 \cdot 2021 - 262425.9951$
$= 10,823.925 \approx 10,824$ students

[0]Total points: 60