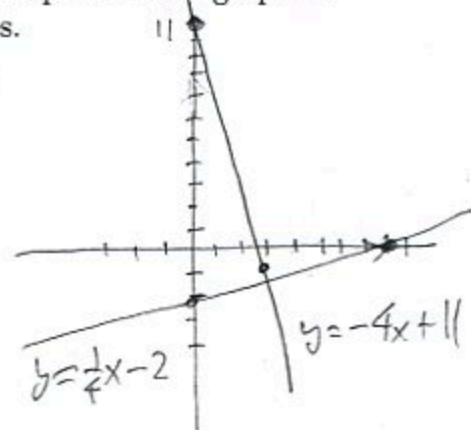


1. (10pts) Find the equation of the line (in form $y = mx + b$) that passes through point $(3, -1)$ and is perpendicular to the line $x - 4y = 8$. Draw both lines.

$$\begin{aligned} x - 4y &= 8 \\ -4y &= -x + 8 \quad | \div (-4) \\ y &= \frac{1}{4}x - 2 \\ m &= \frac{1}{4}, \text{ so slope of perp. line} \\ &\text{is } -\frac{1}{\frac{1}{4}} = -4 \end{aligned}$$

desired line:

$$\begin{aligned} y - (-1) &= -4(x - 3) \\ y + 1 &= -4x + 12 \\ y &= -4x + 11 \end{aligned}$$



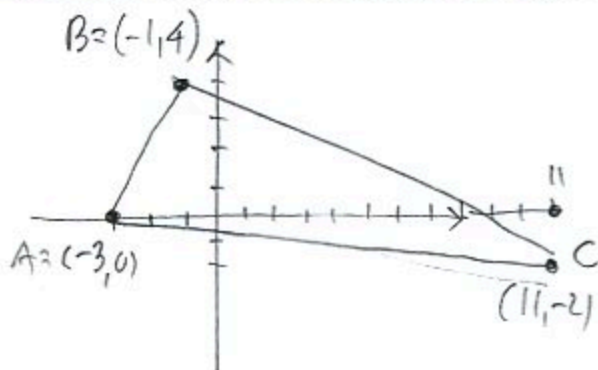
2. (5pts) Find the linear function f its x -intercept is -2 and $f(5) = 1$.

line goes through points,
 $(-2, 0)$ and $(5, 1)$

$$m = \frac{1 - 0}{5 - (-2)} = \frac{1}{7}$$

$$\begin{aligned} y - 0 &= \frac{1}{7}(x - (-2)) \\ y &= \frac{1}{7}x + \frac{2}{7} \end{aligned}$$

3. (9pts) Draw the triangle with vertices $A = (-3, 0)$, $B = (-1, 4)$, and $C = (11, -2)$. Use slopes to determine if the triangle is a right triangle.



$$m_{AB} = \frac{4 - 0}{-1 - (-3)} = \frac{4}{2} = 2$$

$$m_{BC} = \frac{-2 - 4}{11 - (-1)} = \frac{-6}{12} = -\frac{1}{2}$$

$$m_{AC} = \frac{-2 - 0}{11 - (-3)} = \frac{-2}{14} = -\frac{1}{7}$$

Since 2 and $-\frac{1}{2}$
 are opposite
 reciprocal,
 AB and BC
 are perpendicular

4. (4pts) The consumption of gasoline in the U.S. has varied over the years. In 2011, 3.195 billion barrels were consumed; in 2016, 3.413 billion barrels of gasoline were consumed. What is the average rate of change of gasoline consumed from 2011 to 2016? What are the units for the average rate of change?

average rate
 of change
 of gasoline
 consumption = $\frac{3.413 - 3.195}{2016 - 2011} = \frac{0.218}{5} = 0.0436$ billion gallons
 per year

5. (12pts) A business that manufactures decorative plates keeps track of its expenses. One month, it produced 124 plates and had expenses of \$2977.76. Another month, it produced 185 plates and had expenses of \$4029.40.

- a) Assuming that the business expenses $E(x)$ is a linear function of the number of plates x produced, write a formula for $E(x)$.
 b) What are the expenses if no plates are produced? What is the meaning of this number?
 c) What is the meaning of the slope in this example?

a) Need line through

$(124, 2977.76)$ and $(185, 4029.40)$

$$m = \frac{4029.40 - 2977.76}{185 - 124} = \frac{1051.64}{61} = 17.24$$

$$y - 2977.76 = 17.24(x - 124)$$

$$y = 17.24x + 840$$

$$E(x) = 17.24x + 840$$

b) $E(0) = 840$

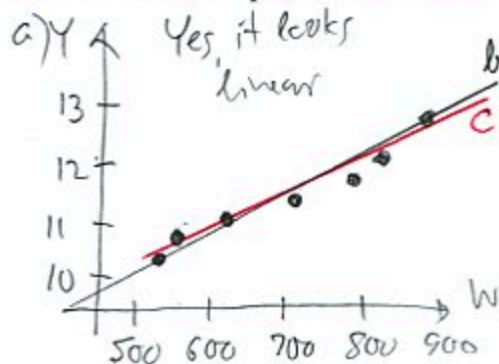
These are fixed cost
(for example rent,
insurance, etc.)

c) slope is cost per plate

6. (20pts) A farmer is trying to establish the relationship between the amount of rainfall during growing season and the yield of corn on his farm. The table shows the data: W is the amount of rainfall in millimeters and Y is the corn yield in tons. 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 W and Y . 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 W and Y ?
 e) What yield can the farmer expect if the the amount of rainfall in a year is 750 millimeters?

W	Y
535	10.2
556	10.7
625	11
705	11.3
790	11.5
810	11.9
888	12.5



b) Use $(535, 10.2)$ and $(888, 12.5)$

$$m = \frac{12.5 - 10.2}{888 - 535} = \frac{2.3}{353} = 0.00651558$$

$$y - 10.2 = \frac{2.3}{353}(x - 535)$$

$$y = 0.00651558x + 6.714164$$

d) $r = 0.970775$ strong l. rel.

c) $y = 0.00549735x + 7.444785$

e) $0.00549735 \times 750 + 7.444785 = 11.567798$