College Algebra — Joysheet 3
MAT 140, Spring 2025 — D. Ivanšić

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

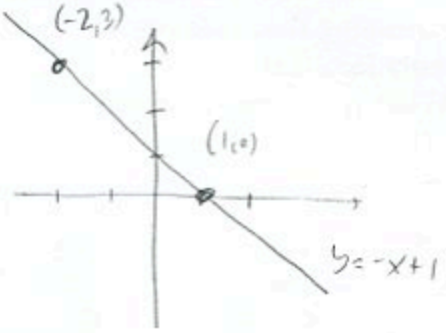
1. (6pts) Find the equation of the line (in form $y = mx + b$) whose x-intercept is 1, and passes through point $(-2, 3)$ Draw the line.

Pts on line: $(1,0), (-2,3)$

$m = \frac{3-0}{-2-1} = \frac{3}{-3} = -1$

$y - 0 = -1(x-1)$

$y = -x + 1$



2. (10pts) Find the equation of the line (in form $y = mx + b$) passing through $(1, -2)$ that is perpendicular to the line $3x - 4y = 12$. Draw both lines.

$3x - 4y = 12$

$-4y = -3x + 12$

$y = \frac{-3x}{-4} + \frac{12}{-4} = \frac{3}{4}x - 3$

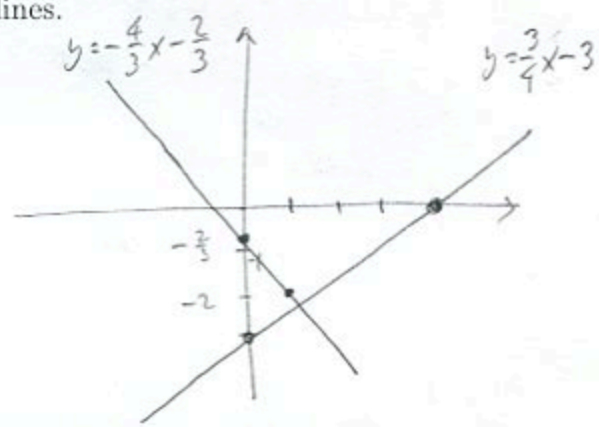
$m = \frac{3}{4}$ so slope of perp. line is $-\frac{4}{3}$

Perp. line:

$y - (-2) = -\frac{4}{3}(x-1)$

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

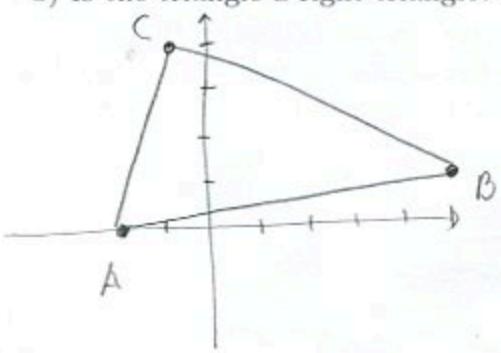
$y = -\frac{4}{3}x - \frac{2}{3}$



3. (8pts) Draw the triangle with vertices $A = (-2, 0)$, $B = (5, 1)$ and $C = (-1, 4)$ in the coordinate plane.

a) Find the slopes of the sides AB, BC and AC.

b) Is the triangle a right triangle? Explain.



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

$m_{BC} = \frac{4-1}{-1-5} = \frac{3}{-6} = -\frac{1}{2}$

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

No two slopes are opposite reciprocals of each other, so no two sides are perpendicular

Not a right triangle.

4. (4pts) In 2010 the US gross domestic product (GDP) was \$15,049 billion and in 2022 it was \$26,007 billion. What is the average rate of change of the US GDP from 2010 to 2022? What are the units for the average rate of change?

Average rate of change $= \frac{26,007 - 15,049}{2022 - 2010} = \frac{10,958}{12} = 913.166667$ billion dollars per year

5. (12pts) On one ride with a cab company, you rode 5 miles and paid \$13.84 and on another ride with the same company, you rode 11 miles and paid \$26.98.
a) Assuming that ride cost $C(x)$ is a linear function of the number of miles driven, write a formula for $C(x)$.
b) What is the cost if no miles are driven? What is the meaning of this number?
c) What is the meaning of the slope in this example?

Need line through $(5, 13.84), (11, 26.98)$

a) $m = \frac{26.98 - 13.84}{11 - 5} = \frac{13.14}{6} = 2.19$

$y - 13.84 = 2.19(x - 5)$

$y - 13.84 = 2.19x - 10.95$

$y = 2.19x + 2.89$

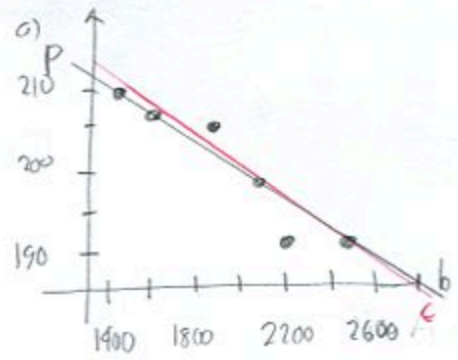
$C(x) = 2.19x + 2.89$

b) $C(0) = 2.89$ is the initial fee for every ride.

c) 2.89 is cost per mile ridden

6. (20pts) A homebuyer is investigating the relationship between total area A of new houses (in square feet) and their prices per square foot. Below is the data they found on several homes. 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 A and P. 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 coefficient of correlation r. How strong is the linear relationship between A and P?
e) What price per square foot can the homebuyer expect for a home with area 2350 square feet?

A	P
1450	210
1600	207
1900	205
2100	195
2200	190
2500	190



Looks linear

b) Line through $(1600, 207), (2500, 190)$

$m = \frac{190 - 207}{2500 - 1600} = \frac{-17}{900}$

$y - 207 = -\frac{17}{900}(x - 1600)$

$y = -0.0188889x + 237.222222$

c) $y = -0.0215528x + 241.70749$

d) $r = -0.943704$ close to -1, so linear relationship is strong

e) $-0.0188889 \cdot 2350 + 237.222222 = 191.0585$