College Algebra — Joysheet 3
MAT 140, Spring 2026 — D. Ivanšić

Name: Saul Ocean

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

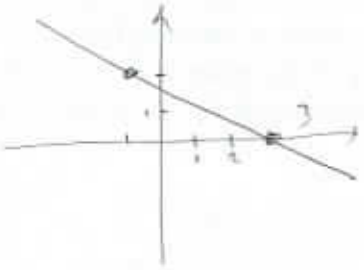
1. (5pts) Find the equation of the line (in form $y = mx + b$) whose x-intercept is 3 and passes through point $(-1, 2)$. Draw the line.

goes through $(3,0)$ and $(-1,2)$

$m = \frac{2-0}{-1-3} = \frac{2}{-4} = -\frac{1}{2}$

$y - 0 = -\frac{1}{2}(x-3)$

$y = -\frac{1}{2}x + \frac{3}{2}$



2. (10pts) Find the equation of the line (in form $y = mx + b$) passing through $(2, -4)$ that is perpendicular to the line $3x - 2y = 6$. Draw both lines.

$3x - 2y = 6$

$-2y = -3x + 6 \quad / \div(-2)$

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

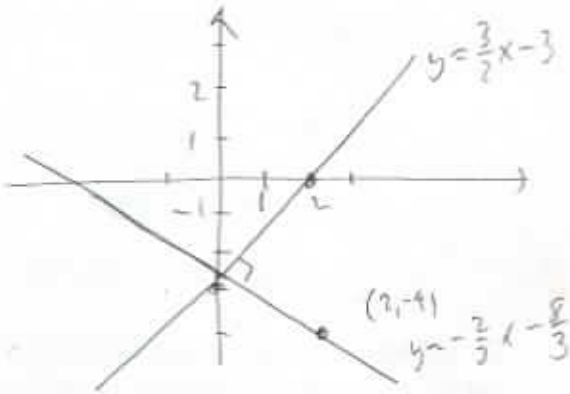
slope $= \frac{3}{2}$

slope of perp line: $-\frac{2}{3}$

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

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

$= -\frac{2}{3}x - \frac{8}{3}$

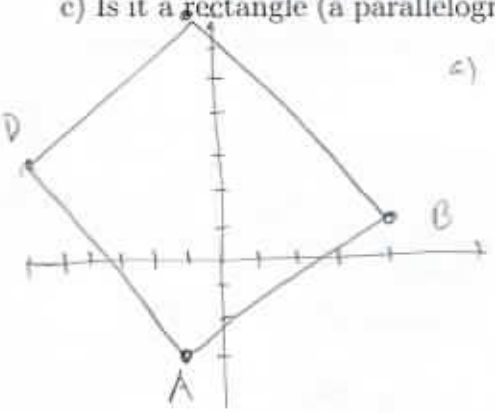


3. (9pts) Draw the quadrangle with vertices $A = (-1, -3)$, $B = (4, 1)$, $C = (-1, 7)$ and $D = (-6, 3)$.

a) Find the slopes of the sides of the quadrangle.

b) Use slopes to check if the quadrangle is a parallelogram (has two pairs of parallel sides).

c) Is it a rectangle (a parallelogram with adjacent sides perpendicular)? Use slopes to check.



a) $m_{AB} = \frac{1-(-3)}{4-(-1)} = \frac{4}{5}$

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

$m_{CD} = \frac{3-7}{-6-(-1)} = \frac{-4}{-5} = \frac{4}{5}$

$m_{AD} = \frac{3-(-3)}{-1-(-6)} = \frac{6}{-5} = -\frac{6}{5}$

b) yes, it is a parallelogram, as AB and CD; BC and AD have same slopes, so are parallel

c) No two slopes are opposite reciprocal, so no two sides are perpendicular — not a rectangle

4. (4pts) The median home price in the US at end of 2018 was \$322,800. At end of 2024, it was \$419,300. What is the average rate of change of median home price from 2018 to 2024? What are the units for the average rate of change?

average rate of chg of median home price $= \frac{419,300 - 322,800}{2024 - 2018} = \frac{96,500}{6} = 16,083.33$ dollars per year

5. (12pts) The water bill for a household was \$52.03 in a month when it used 42 hundred-gallons of water. In another month, it used 51 hundred-gallons and was billed \$56.44.
a) Assuming that water cost $C(x)$ is a linear function of the amount of water x used (in hundred-gallons), 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?

Need line through
$(42, 52.03), (51, 56.44)$

$m = \frac{56.44 - 52.03}{51 - 42} = \frac{4.41}{9} = 0.49$

$y - 52.03 = 0.49(x - 42)$

$y = 0.49x - 20.58 + 52.03$

$y = 0.49x + 31.45$

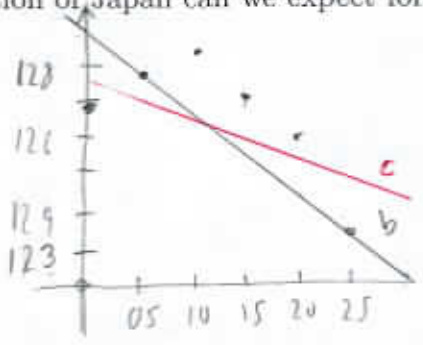
$C(x) = 0.49x + 31.45$

b) $C(0) = 31.45$
is the monthly fee

c) slope is cost of a hundred-gallon of water.

6. (20pts) A statistician is trying to establish a trend for the population of Japan. In the table, P is the population, in millions, of Japan in year x. 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 x. 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 x and P?
e) What population of Japan can we expect for 2030?

x	P
2000	126.9
2005	127.8
2010	128.1
2015	127.1
2020	126.1
2025	123.2



Somewhat linear relationship

b) Use $(2005, 127.8), (2025, 123.2)$

$m = \frac{123.2 - 127.8}{2025 - 2005} = \frac{-4.6}{20} = -0.23$

$y - 127.8 = -0.23(x - 2005)$

$y = -0.23x + 461.15 + 127.8$

$y = -0.23x + 588.95$

c) $y = -0.140571x + 409.433333$

d) $r = -0.739391$ Not that strong
Z not so close to 1 or -1

e) $-0.140571 \cdot 2030 + 409.433333$
$= 124.0742$ million people