

Exam 1 – Practice 2

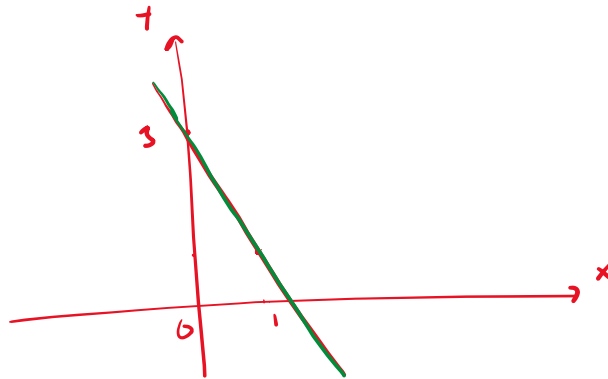
Exam Guidelines This is an in-class, written exam with a 75-minute time limit.

- **Permitted Materials:** You may use a basic calculator and a formula sheet.
- **Formula Sheet Restrictions:** Your sheet must contain **formulas only**; no examples or worked problems are permitted. All sheets will be inspected at the start of the exam.
- **Prohibited Items:** Phones and all other smart devices are strictly forbidden.
- **Academic Integrity:** The use of AI is prohibited. Any AI usage will result in an automatic **F** for the exam and may lead to failing the entire course.

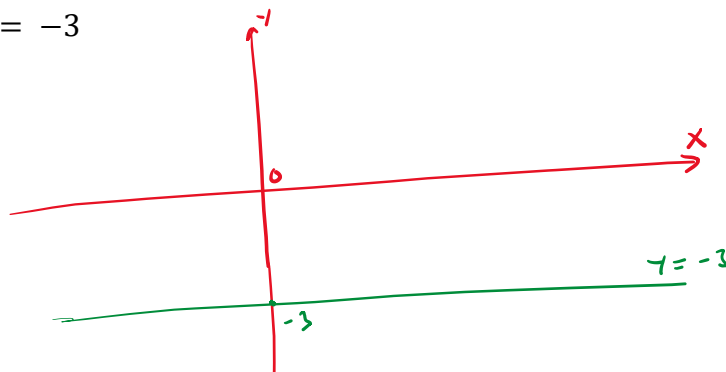
1. Graph the below line.

a. $y = -2x + 3$

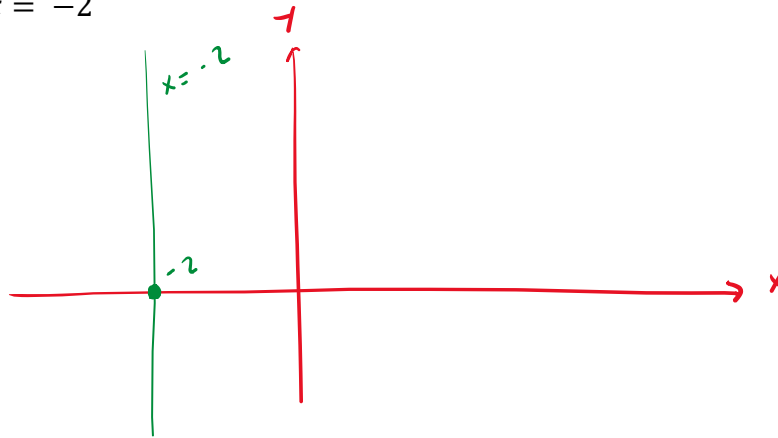
$x = 0, y = 3 \Rightarrow (0, 3)$
 $x = 1, y = 1 \Rightarrow (1, 1)$



b. $y = -3$



c. $x = -2$



2. Write the equation of the line

a. passing through two points (1, 0) and (2, -3)

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

$$\Rightarrow y = -3(x-1)$$

$$\Rightarrow \boxed{y = -3x + 3}$$

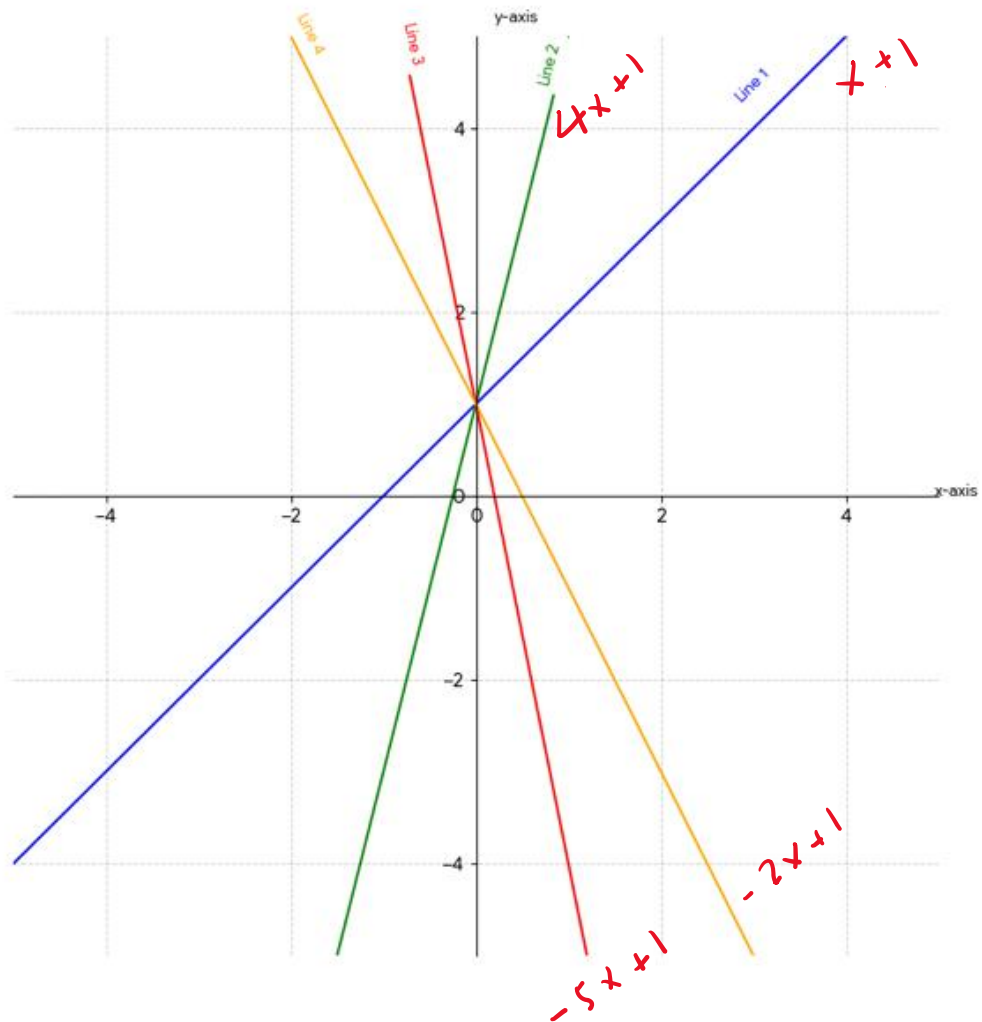
b. with the slope of 3 and passing through (1, -2)

$$y = 3(x-1) - 2$$

$$\Rightarrow y = 3x - 3 - 2$$

$$\Rightarrow \boxed{y = 3x - 5}$$

3. Match each equation to its corresponding graph.



- a. $y = x + 1$ line 1
- b. $y = -5x + 1$ line 3
- c. $y = 4x + 1$ line 2
- d. $y = -2x + 1$ line 4

4. You operate a small farmers' market stand that sells fresh organic honey.

Market research shows that you can sell 200 jars per month if the price is \$6 per jar, but sales drop to 80 jars per month if the price is raised to \$14 per jar.

On the supply side, local beekeepers are willing to supply 60 jars per month when the price is \$5 per jar, but they will increase production to 180 jars per month if the price rises to \$13 per jar.

a. Write the linear demand function and the linear supply function.

Supply :

P	Q _s
6	200
14	80

$$\Rightarrow Q_s = \frac{80 - 200}{14 - 6} \cdot (P - 6) + 200$$

$$Q_s = -15 (P - 6) + 200$$

$$Q_s = -15P + 90 + 200$$

$$Q_s = -15P + 290$$

Demand

P	Q _d
5	60
13	180

$$\Rightarrow Q_d = \frac{180 - 60}{13 - 5} \cdot (P - 5) + 60$$

$$\Rightarrow Q_d = 15 (P - 5) + 60$$

$$\Rightarrow Q_d = 15p - 75 + 60$$

$$\Rightarrow \boxed{Q_d = 15p - 15}$$

b. Find the equilibrium point. At what price must the honey be sold so that quantity supplied equals quantity demanded?

$$Q_s = Q_d$$

$$\Rightarrow -15p + 290 = 15p - 15$$

$$\Rightarrow 290 + 15 = 15p + 15p$$

$$\Rightarrow 305 = 30p$$

$$\Rightarrow p = \frac{305}{30} \approx 10.17$$

5. A company that manufactures custom hoodies has fixed monthly costs of \$75,000 and variable costs of \$40 per hoodie produced. Each hoodie sells for \$110.

a. Find the cost function.

$$C = 40q + 75000$$

b. Find the revenue function.

$$R = 110q$$

- c. Graph and clearly label the cost and revenue functions on the same set of axes. Identify and label the break-even point.

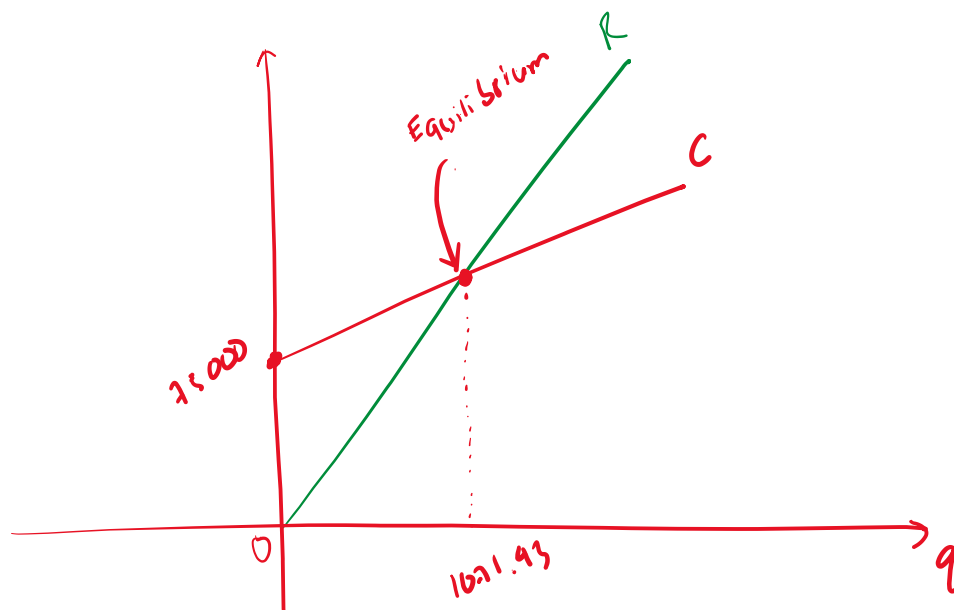
$$R = C$$

$$\Rightarrow 110q = 40q + 7500$$

$$\Rightarrow 110q - 40q = 7500$$

$$\Rightarrow 70q = 7500$$

$$\Rightarrow q \approx 1071.43$$



- d. Find the profit function.

$$\begin{aligned}
 \text{Profit} &= 110q - (40q + 75000) \\
 &= 110q - 40q - 75000 \\
 &= \boxed{70q - 75000}
 \end{aligned}$$

e. How much profit will the company make by producing and selling 2,000 hoodies?

$$\begin{aligned}
 q &= 2000 \\
 \Rightarrow \text{Profit} &= 70 \times 2000 - 75000 \\
 &= 65000
 \end{aligned}$$

f. How many hoodies must be produced and sold in order to obtain a profit of \$75,000?

$$\begin{aligned}
 75000 &= 70q - 75000 \\
 \Rightarrow 75000 + 75000 &= 70q \\
 \Rightarrow 150000 &= 70q \\
 \Rightarrow q &= \frac{150000}{70} \approx 2142.86
 \end{aligned}$$

6. Two investment options that earn simple interest are available.

Investment A starts with \$1,500 and earns **simple interest at an annual rate of 3%**.

Investment B starts with \$2,400 and earns **simple interest at an annual rate of 1.5%**.

a. Write a **linear equation** that represents the total amount of money in each investment after t years.

$$A = 1500 + 1500 \times .03 t$$

$$A = 1500 + 45t$$

Investment B :

$$B = 2400 + 2400 \times .015 t$$

$$B = 2400 + 36t$$

b. How much money will there be in **Investment A** after 4 years?

$$t = 4$$

$$\Rightarrow A = 1500 + 45t$$

$$= 1500 + 45 \times 4$$

$$= 1680$$

c. When will **Investment A** reach \$1,860?

$$A = 1860$$

$$\Rightarrow 1500 + 45t = 1860$$

$$\Rightarrow 45t = 1860 - 1500$$

$$\Rightarrow 45t = 360$$

$$\Rightarrow t = \frac{360}{45} = 8$$

d. Determine which investment **grows faster** and explain your answer by comparing the **slopes** of the two equations.

$$A = 1500 + 45t \quad (\text{slope} = 45)$$

$$B = 2400 + 36t \quad (\text{slope} = 36)$$

\Rightarrow A grows faster due to greater slope

e. Determine whether the two investments will ever have the **same total value**. If so, find when this occurs.

$$A = B$$

$$\Rightarrow 1500 + 45t = 2400 + 36t$$

$$\Rightarrow 45t - 36t = 2400 - 1500$$

$$\Rightarrow 9t = 900$$

$$\Rightarrow t = 100$$

f. Plot both investment functions on the same coordinate system.

