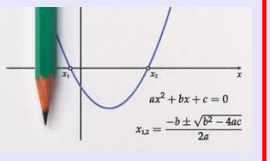
# Math 125

# Spring 2022

# Lecture 12




Class QZ 9

Solve

$$\begin{cases} 3x + 2y = 11 \\ x - y = -3 \end{cases} \Rightarrow$$

$$\begin{cases} 3x + 2y = 11 \\ 2x - 2y = -6 \end{cases}$$

$5x = 5$

$1 - y = -3$

$-y = -3 - 1$

$-y = -4$

$-1y = -4$

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

$x = 1$ ✓

$y = 4$ ✓

$\Rightarrow (1,4)$

$\{(1,4)\}$

Show the ordered-triple $(-1, -4, 5)$ is a Solution of the system below.

$$\begin{cases} x - 2y + 3z = 22 \checkmark \\ 2x - 3y - z = 5 \checkmark\checkmark \\ 3x + y - 5z = -32 \checkmark\checkmark\checkmark \end{cases}$$

$x - 2y + 3z = 22$

$-1 - 2(-4) + 3(5) = 22$

$-1 + 8 + 15 = 22$

$7 + 15 = 22$

$22 = 22$

$2x - 3y - z = 5$

$2(-1) - 3(-4) - 5 = 5$

$-2 + 12 - 5 = 5$

$10 - 5 = 5$

$5 = 5$

$3x + y - 5z = -32$

$3(-1) - 4 - 5(5) = -32$

$-3 - 4 - 25 = -32$

$-7 - 25 = -32$

$-32 = -32$

System is Consistent.

Solve

$$\begin{cases} 5x - 2y - 4z = 3 \\ 3x + 3y + 2z = -3 \\ -2x + 5y + 3z = 3 \end{cases}$$

$$\begin{cases} 5x - 2y - 4z = 3 \\ 2(3x + 3y + 2z = -3) \end{cases}$$

$$\begin{cases} 5x - 2y - 4z = 3 \\ 6x + 6y + 4z = -6 \end{cases}$$

$11x + 4y = -3$

$$\begin{cases} 5x - 2y - 4z = 3 \\ 4(-2x + 5y + 3z = 3) \end{cases}$$

$$\begin{cases} 15x - 6y - 12z = 9 \\ -8x + 20y + 12z = 12 \end{cases}$$

$7x + 14y = 21$

Divide by 7 to reduce

$x + 2y = 3$

Solve

$$\begin{cases} 11x + 4y = -3 \\ -2(x + 2y = 3) \end{cases}$$

$$\begin{cases} 11x + 4y = -3 \\ -2x - 4y = -6 \end{cases}$$

$9x = -9$

$x = \frac{-9}{9}$

$x = -1$

$-1 + 2y = 3$

$2y = 3 + 1$

$2y = 4$

$y = 2$

$5x - 2y - 4z = 3$

$5(-1) - 2(2) - 4z = 3$

$-5 - 4 - 4z = 3$

$-9 - 4z = 3$

$-4z = 3 + 9$

$-4z = 12$

$z = -3$

Final Ans: $(-1, 2, -3)$

Solution Set $\{(-1, 2, -3)\}$

Solve

$$\begin{cases} x + 2y + z = 17 \\ 2y - z = 7 \\ 2x - 3y + 2z = -1 \end{cases}$$

$x$ is missing, so let's eliminate $x$ using other two equations.

$$-2\begin{cases} x + 2y + z = 17 \\ 2x - 3y + 2z = -1 \end{cases}$$

$$\begin{cases} -2x - 4y - 2z = -34 \\ 2x - 3y + 2z = -1 \end{cases}$$

$$-7y = -35$$

$$y = \frac{-35}{-7}$$

$$\boxed{y = 5}$$

$2y - z = 7$

$2(5) - z = 7$

$10 - z = 7$

$-z = 7 - 10$

$-z = -3$

$$\boxed{z = 3}$$

$x + 2y + z = 17$

$x + 2(5) + 3 = 17$

$x + 13 = 17$

$$\boxed{x = 4}$$

Final Ans: $(4, 5, 3)$

Solution Set: $\{(4, 5, 3)\}$

Solve

$$\begin{cases} 2x + 5y + z = 12 \\ x - 2y + 4z = -10 \\ -3x + 6y - 12z = 20 \end{cases}$$

$$-2\begin{cases} 2x + 5y + z = 12 \\ x - 2y + 4z = -10 \end{cases} \Rightarrow \begin{cases} 2x + 5y + z = 12 \\ -2x + 4y - 8z = 20 \end{cases}$$

$$\boxed{9y - 7z = 32}$$

$$3\begin{cases} x - 2y + 4z = -10 \\ -3x + 6y - 12z = 20 \end{cases}$$

$$\begin{cases} 3x - 6y + 12z = -30 \\ -3x + 6y - 12z = 20 \end{cases}$$

$0 = -10$

False

$\Rightarrow \emptyset$

No Solution

System is inconsistent.

The sum of three numbers is 10. The largest one is equal to the sum of the other two numbers. 3 times the smallest one is equal to twice the middle number. Find all three numbers.

S → Smallest one
M → Middle one
L → Largest one

$S + M + L = 10$
$L = S + M$
$3S = 2M$

$\begin{cases} S + M + L = 10 \\ -S - M + L = 0 \\ 3S - 2M = 0 \end{cases} \Rightarrow \begin{cases} S + M + L = 10 \\ -S - M + L = 0 \end{cases}$

$2L = 10 \quad \boxed{L = 5}$

$\begin{cases} S + M + 5 = 10 \\ 3S - 2M = 0 \end{cases} \quad \begin{cases} S + M = 10 - 5 \\ 3S - 2M = 0 \end{cases}$

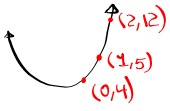
$2\begin{cases} S + M = 5 \\ 3S - 2M = 0 \end{cases} \Rightarrow \begin{cases} 2S + 2M = 10 \\ 3S - 2M = 0 \end{cases}$

$5S = 10 \quad \boxed{S = 2}$

$S + M = 5$
$2 + M = 5 \quad \boxed{M = 3}$

The three numbers are 2, 3, and 5.

Graph of the equation $y = ax^2 + bx + c$ contains the points $(1,5)$, $(2,12)$, and $(0,4)$. Find the equation.




$(1,5) \rightarrow x = 1, y = 5$
$y = ax^2 + bx + c$
$5 = a(1)^2 + b(1) + c$
$\boxed{5 = a + b + c}$

$(2,12) \rightarrow x = 2, y = 12$
$y = ax^2 + bx + c$
$12 = a(2)^2 + b(2) + c$
$\boxed{12 = 4a + 2b + c}$

$(0,4) \rightarrow x = 0, y = 4$
$y = ax^2 + bx + c$
$4 = a(0)^2 + b(0) + c$
$\boxed{4 = c}$

$\begin{cases} a + b + \boxed{c} = 5 \\ 4a + 2b + \boxed{c} = 12 \\ c = 4 \end{cases}$

$a + b + 4 = 5 \quad \begin{cases} a + b = 1 \\ 4a + 2b = 8 \end{cases}$ Divide by 2

Solve $\begin{cases} a + b = 1 \\ 2a + b = 4 \end{cases} \Rightarrow \begin{cases} -a - b = -1 \\ 2a + b = 4 \end{cases}$ $\times -1$

$\boxed{a = 3}$

$a + b = 1$
$3 + b = 1 \quad \boxed{b = -2}$

the equation is $\boxed{y = 3x^2 - 2x + 4}$

March 17, 2022

I have $1 in Nickels, Dimes, and Quarters.
I have 9 coins. → 100¢
# of Quarters is half of # of Nickels.
How many of each do I have?

N → # Nickels
D → # Dimes
Q → # Quarters

$N + D + Q = 9$
$5N + 10D + 25Q = 100$
$Q = \frac{1}{2}N$

Multiply by 2 → $2Q = N$
Divide by 5 to reduce

$N + D + Q = 9$
$N + 2D + 5Q = 20$
$-N \quad + 2Q = 0$

D is Missing
Eliminate D

$-2\{ N + D + Q = 9$
$N + 2D + 5Q = 20$

$-2N - 2D - 2Q = -18$
$N + 2D + 5Q = 20$
$-N \quad + 3Q = 2$

$-1\{ -N + 2Q = 0$
$-N + 3Q = 2$

$-N - 2Q = 0$
$-N + 3Q = 2$
$Q = 2$
2 Quarters

$Q = \frac{1}{2}N$
$2 = \frac{1}{2}N$
$4 = N$
4 Nickels

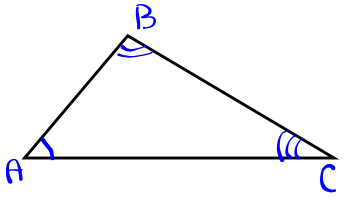
$N + D + Q = 9$
$4 + D + 2 = 9$
$D = 3$
3 Dimes

I have 4 Nickels, 3 Dimes, and 2 Quarters.

---

In triangle ABC, angle B is twice angle A. Angle C is 50° less than 20 times angle A.

Find all three angles.




$B = 2A$
$C = 20A - 50$
$A + B + C = 180°$

$A + 2A + 20A - 50 = 180$
$23A = 180 + 50$
$23A = 230$
$A = 10°$

$B = 2A$
$= 2(10)$
$B = 20°$

$C = 20A - 50$
$= 20(10) - 50$
$= 200 - 50$
$C = 150°$

I deposited $2000 into two accounts.

One pays 4%, and the other pays 3%.

Simple interest. $I = P \cdot r \cdot t$

After 1 year, I made $72 in interest. ($t = 1$)

How much per account?

$\$x \rightarrow 4\%$ account

$\$y \rightarrow 3\%$ account

$$\begin{cases} x + y = 2000 \\ 4\%x + 3\%y = 72 \end{cases} \quad (\times 100)$$

$$\begin{cases} x + y = 2000 \\ 4x + 3y = 7200 \end{cases} \quad (\times -3)$$

$$\begin{cases} -3x - 3y = -6000 \\ 4x + 3y = 7200 \end{cases}$$

$$x = 1200$$

$1200 @ 4% rate

$800 @ 3% rate

---

I deposited $10,000 in 3 accounts.

all Simple interest 2%, 5%, and 10%.

I made $690 in one year.

Amount at 2% account was $1000 less than the amount at 5% account. How much per account?

$\$x$ @ 2%

$\$y$ @ 5%

$\$z$ @ 10%

$$\begin{cases} x + y + z = 10000 \\ 2\%x + 5\%y + 10\%z = 690 \\ x = y - 1000 \end{cases} \quad (\times 100)$$

$$\begin{cases} x + y + z = 10000 \\ 2x + 5y + 10z = 69000 \\ x - y = -1000 \end{cases}$$

$$\begin{cases} x + y + z = 10000 \\ 2x + 5y + 10z = 69000 \end{cases} \quad (\times -10)$$

$$-8x - 5y = -31000$$

multiply by $-1$

$$\begin{cases} 8x + 5y = 31000 \\ x - y = -1000 \end{cases} \quad (\times 5)$$

$$13x = 26000$$

$x = \frac{26000}{13}$

$x = 2000$

$2000 - y = -1000$

$2000 + 1000 = y$

$y = 3000$

$2000 @ 2%

$3000 @ 5%, and

$5000 @ 10%

## Nonlinear System of equations

$$\begin{cases} x^2 + y^2 = 25 \\ x^2 - y^2 = 7 \end{cases}$$

$$2x^2 = 32$$

Divide by 2

$$x^2 = 16$$

$$x = \pm 4$$

$$16 + y^2 = 25$$

$$y^2 = 25 - 16$$

$$y^2 = 9$$

$$y = \pm 3$$

4 Answers

$(4,3), (4,-3), (-4,3), (-4,-3)$

## Class QZ 10

I asked one student earlier to share her reaction about something.

1) what was her name?

Maria

2) Reaction was about what?

for students join the meeting late.