

Assignment 02**(Due Thursday, Oct 2 @ 12:00 PM pdf on Canvas)**

Q1) Grade-Tonnage curves visually represent the impact of cut-off grades on mineral reserves. The Grade Tonnage Curves display the tonnage above the cut-off grade and the average grade of a deposit relative to the cut-off grade (COG). The following tables show the tonnage-COG and the economic and technical parameters for a gold mine.

Tonnage-COG		
Interval	COG (oz/t)	Ore Tonnage (kt)
1	0.010	70,000
2	0.023	7,257
3	0.028	6,319
4	0.033	5,591
5	0.038	4,598
6	0.043	4,277
7	0.048	3,465
8	0.053	2,438
9	0.058	2,307
10	0.063	1,747
11	0.068	1,640
12	0.073	1,485
13	0.078	1,227
14	0.090	3,598
15	0.229	9,576
Total		125,525

Economic and technical parameters			
Notation	Explanation	Value	Unit
s	Price	1500	\$/oz
m	Mining cost	1.8	\$/ton
c	Milling cost	16	\$/ton
r	Refining cost	10	\$/oz
f	Annual fixed costs	9.25	M\$/a
y	Recovery	88	%
D	Dilution	15	%
i	Discount rate	12	%
DP	Discounted price	300	\$/oz
R	Royalty	5	%
M	Mining capacity	Unlimited	Mt/a
C	Milling capacity	1.65	Mt/a
R_{Cap}	Refining Capacity	8500	t/a

- 1) Plot grade-tonnage curve (All plots must be prepared using Excel, OriginPro, MATLAB, or Python)
- 2) Calculate modified break-even COG considering (a) losses to royalty and (b) dilution of the deposit.
- 3) For the obtained break-even COG in part (2), after considering royalty and dilution, calculate
 - a. Quantity of ore (kt)
 - b. Quantity of waste (kt)
 - c. Stripping ratio
 - d. Average grade (oz/t)
- 4) Considering the given milling capacity, calculate
 - a. Annual ore production, Q_c , (Mt)
 - b. Annual quantity of mined material (ore and waste), Q_m , (Mt)
 - c. Annual quantity of refined product, Q_r , (Mt)
- 5) Calculate the mine life.
- 6) Calculate the yearly cash flow using the following equation

$$CF = (s - r)Q_r - mQ_m - cQ_c - f$$

- 7) Calculate the NPV of the project.