

CALIFORNIA STATE UNIVERSITY, FULLERTON

Computer Engineering

EGCP 401 – Engineering Economics & Professionalism

(Spring 2021)

Homework no 2 (Due date: 02/24/2021)

Q2-23 A firm believes a product's sales volume (S) depends on its unit selling price (P) as $S=100-P$. The production cost (C) is $C=\$1,000+10S$.

- Graph the sales volume (S) from 0 to 100 on the x axis, total cost and total income from \$0 to \$2500 on the y axis, $C=\$1000+10S$, and plot the curve of total income. Mark the breakeven points on the graph.
- Determine the breakeven point (lowest sales volume at which total sales income just equals total production cost).
- Determine the sales volume (S) at which the firm's profit is a maximum.

Q2-34 A pump has failed in a facility that will be completely replaced in 3 years. A brass pump costing \$6,000 installed will last 3 years. However, a used stainless steel pump that should last 3 more years has been sitting in the maintenance shop for a year. The pump cost \$13,000 new. The accountant says the pump is worth \$7000 now. The maintenance supervisor says that it will cost an extra \$500 to reconfigure the pump for the new use and that he could sell it used (as is) for \$4000.

- What is the book cost of the stainless steel pump?
- What is the opportunity cost of the stainless steel pump?
- How much cheaper or more expensive would it be to use the stainless steel pump rather than a new brass pump?

Q2-47 SungSam, Inc. is designing a new digital camcorder that is projected to have the following per-unit costs to manufacture:

Cost Categories	Unit Costs
Material costs	\$63
Labor costs	\$24
Overhead costs	\$110
Total unit cost	\$197

SungSam adds 30% to its manufacturing cost for corporate profit

- What unit profit would SungSam realize on each camcorder?
- What is the overall cost to produce a batch of 10,000 camcorders?
- What would SungSam's profit be on the batch of 10,000 if historical data show that 1% of product will be scrapped in manufacturing, 3% of finished product will go unsold, and 2% of sold product will be returned for refund?
- How much can SungSam afford to pay for a contract that would lock in a 50% reduction in the unit material cost previously given? If SungSam does sign the contract, the price will not change.

Q2-50 Fifty years ago, Grandma Bell purchased a set of gold-plated dinnerware for \$48, and last year you inherited it. Unfortunately, a fire at your home destroyed the set. Your insurance company is at a loss to define the replacement cost and has asked your help. You do some research and find that the Aurum Flatware Cost Index (AFCI) for gold-plated dinnerware, which was 127 when Grandma Bell bought her set, is at 1989 today. Use the AFCI to update the cost of Bell's set to today's cost to show to the insurance company.

Q2-66 New technicians in an oncology department process patients at rates shown below. Steady state occurs at the eighth unit.

Patient Number	1	2	3	4	5	6	7	8
Process Time (min)	84	76	61	54	50	48	45	43

- Calculate the learning curve rate for units 1-8.
- What is the total time needed to process 11 patients?

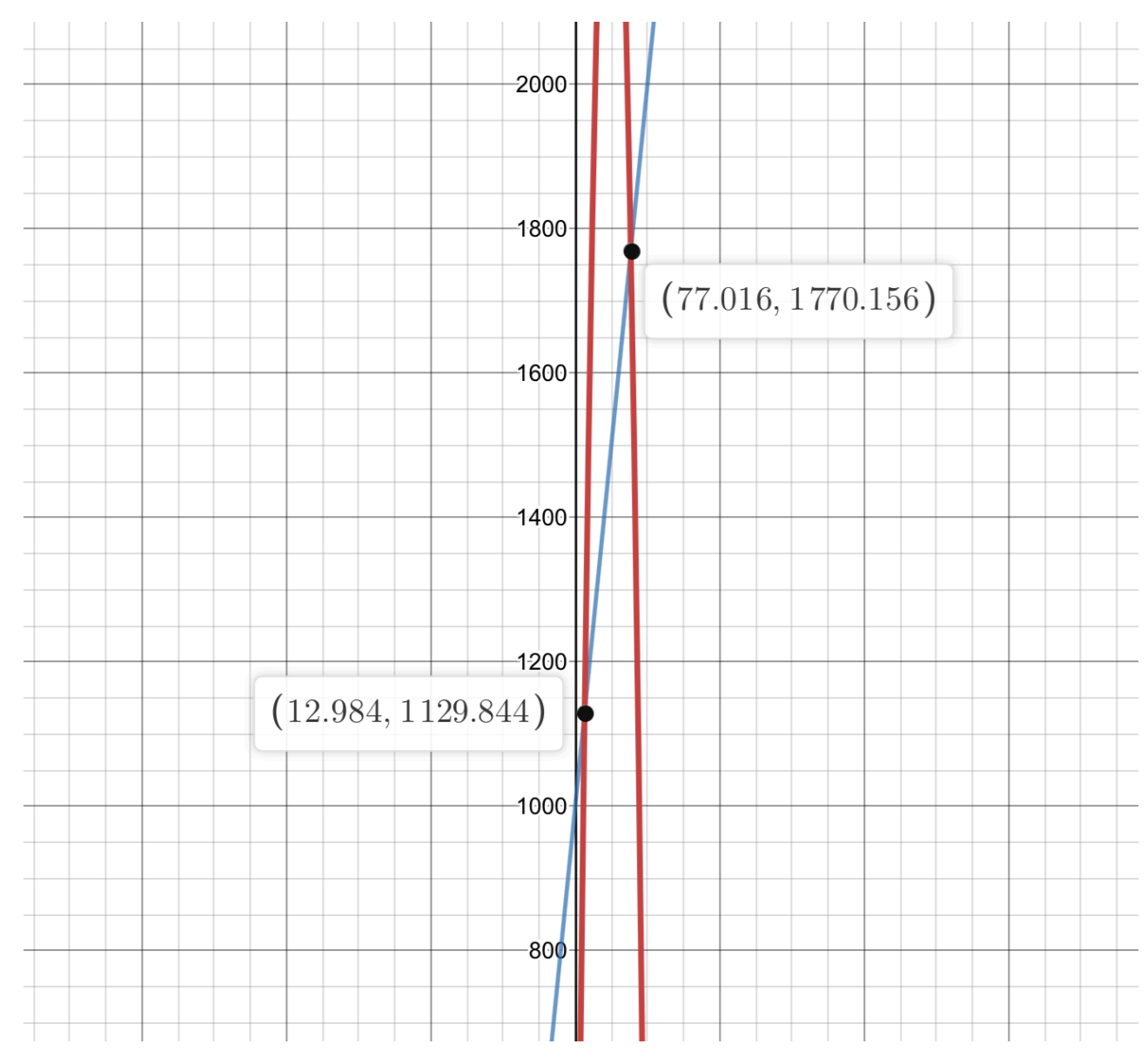
Q3-5 Calculate the interest and total amount due at the end of the loan for both simple and compound interest.

	Loan	Years	Rate
(a)	\$ 1000	2	5%
(b)	\$ 1500	5	6%
(c)	\$10,000	10	10%
(d)	\$25,000	15	15%
(e)	\$47,750	20	20%

Q3-11 A firm borrowed \$5,000,000 for 5 years at 10% per year compound interest. The firm will make no payments until the loan is due, when it will pay off the interest and principle in one lump sum. What is the total payment?

Q 2-23

a) $P = 100 - s$
 $C = 1000 + 10s$
 Revenue = $P \cdot s$
 $(100 - s)(s) = 100s - s^2$



b) Break even
 $C = R$
 $1000 + 10s = 100s - s^2$
 $-s^2 + 90s - 1000 = 0$
 $s = \frac{-90 \pm \sqrt{90^2 - 4(-1)(-1000)}}{2(-1)}$
 $s = 12.984 \rightarrow 13$
13 units

c) Profit = $R - C$

$(100s - s^2) - (1000 + 10s) = 90s - s^2 - 1000$

$\frac{dP}{ds} (90s - s^2 - 1000)$

$-2s + 90$

$2s = 90$

$s = 45$

Volume = 45 max

Q 2-47

a) Unit profit = $\$12(0.3) = \underline{\$54.10}$

b) $\$197 \times 10000 = \underline{\$1,970,000}$

c) $10000 \times 0.01 = 100$
 $9400 \times 0.03 = 282$
 $9603 \times 0.02 = 192$
 $= 589$

$9411(\$54.10) = \underline{\$556,140.10}$

d) $63(0.5) + 24 + 110 = 163.50$

$10000(163.50) = 1635000$

$1970000 - 1635000 = \underline{\$335,000}$

Q 2-34

a) The book cost was \\$7000.

b) The opportunity cost was \\$4000.

c) Take the $\$4000$ from opportunity (plus $\$500$ for re-configure), it is cheaper to use stainless by \\$1500.

Q 2-66

a) $T_n = T_1(n)^b$

$43 = 84(2)^b$

$\frac{43}{84} = (2)^b$

b $\log 8 = \log\left(\frac{43}{84}\right)$

$b = -0.322$

$\frac{\log r}{\log(2)} = -0.322$

$\log r = -0.322(\log(2))$

$r = \text{antilog}(-0.322(\log(2)))$

$r = 0.80$

80% curve

b) $T_{12} = T_1(n)^b$
 $= 84(2)^{-0.322}$
38.8 min

Q 3-5

Simple interest = Loan \times Years \times Rate

Total = Loan + S.I

Compound interest = Total - Loan

Total = Loan $(1 + \text{rate})^{\text{years}}$

a) S.I. $1000(0.05)(2) = \underline{100}$

Total $1000 + 100 = \underline{1100}$

C.I. $1000(1 + 0.05)^2 - 1000 = 102.50$

Total $1000(1 + 0.05)^2 = \underline{1102.50}$

b) S.I. $1500(0.04)(5) = \underline{450}$

Total " + 450 = 1950

C.I. $2007.34 - 1500 = \underline{507.34}$

Total $1500(1 + 0.06)^5 = \underline{2007.34}$

c) S.I. $10000(.1)(10) = \underline{10000}$

Total $10000 + 10000 = \underline{20000}$

C.I. $25437.42 - 10000 = \underline{15437.42}$

Total $10000(1 + 0.1)^{10} = \underline{25437.42}$

Every answer = $\$$

d) S.I. $25000(.15)(15) = \underline{56250}$

Total $25000 + 56250 = \underline{81250}$

C.I. $203426.54 - 25000 = \underline{178426.54}$

Total $25000(1 + .15)^{15} = \underline{203426.54}$

e) S.I. $47750(.20)(20) = \underline{191000}$

Total $47750 + 191000 = \underline{238750}$

C.I. $1830620.40 - 47750 = \underline{1782870.40}$

Total $47750(1 + 0.20)^{20} = \underline{1830620.40}$

Q 3-11

$F = P(1+i)^n$

$= 5000000(1+.1)^5$

$= \$8052650$