MGSC 1205
Quantitative Methods I

Class one – Introduction &
Break Even Analysis

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Who am I ?

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Course Objectives

- Introduce some of foundational mathematical approaches to management
- Basic skills for problem solving and decision making in business and economics:
  - ***Qualitative*** skills (setting goals, defining the problem scope, communicating with and getting the support of those who will implement the solution, …)
  - ***Quantitative*** skills (building mathematical models, measuring risk, evaluating alternatives,…)
- Practice using select tools & techniques

Your Learning in This Course Will Occur in Two Ways

- In class examples
- Assignments
  - 6 hand-in assignments
  - Assignments should be stapled in the top left corner with no cover and hand written.

The Requirements for This Course Are Simple

- Read *before* you come to class
- Participate *during* class
- Complete homework assignments *on time*
- Take the exams

Grading Scheme

- Assignments 20%
- Midterm 30%
- Final exam 50%

- In the event that your final exam grade exceeds your midterm grade, the weights for the midterm and final will change to 20% and 60%, respectively.

- **To pass the course you must obtain an overall average of 50% and 40 out of the 80 points assigned to the midterm plus final.**

Course Materials You'll Want to Have

- Textbook: ***Introduction to Quantitative Methods***, Volume 1, Second Custom Edition for Saint Mary's University, Custom Publishing, 2010.
- A course pack, containing all the handouts and assignments from 2004 – 2005 academic year, is available on the **P:** drive for free download.
- ***Help***
  - Lecture notes and assignment solutions will be posted on the **P:** drive (http://drives.smu.ca).
    - P:\Commerce Finance,Information Systems, and Management Science\MGSC1205\Summer 2010
  - Tutorials staffed by student assistants will be available

Course Pre-requisites

- Basic Algebra
  - Order of Operations
  - Factoring
  - Re-arranging Linear Expression
  - Cross-Multiplication
  - Solving 2-equations with 2-unknowns
  - Plotting Linear Graphs
  - Plotting Inequalities

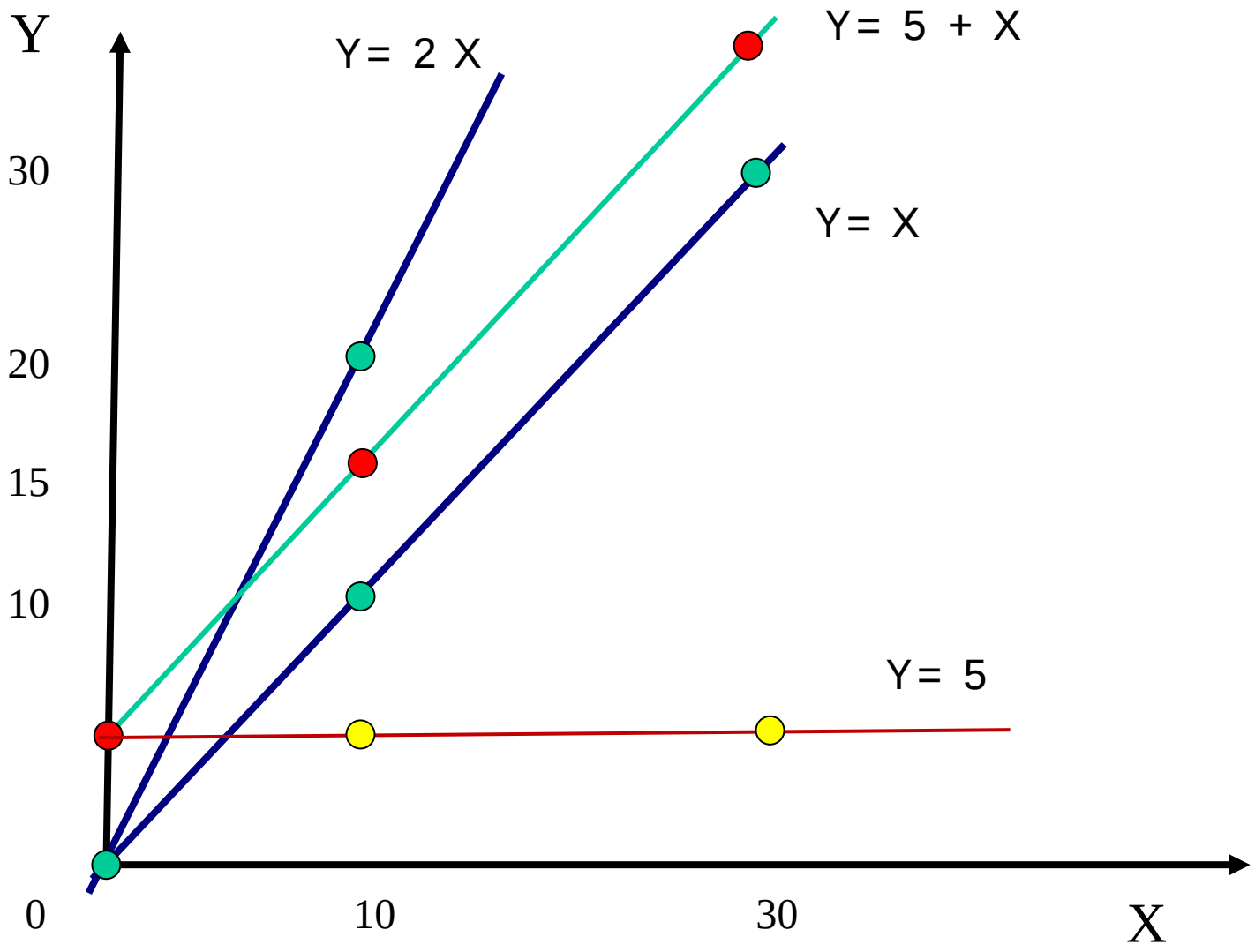
Excel Basics

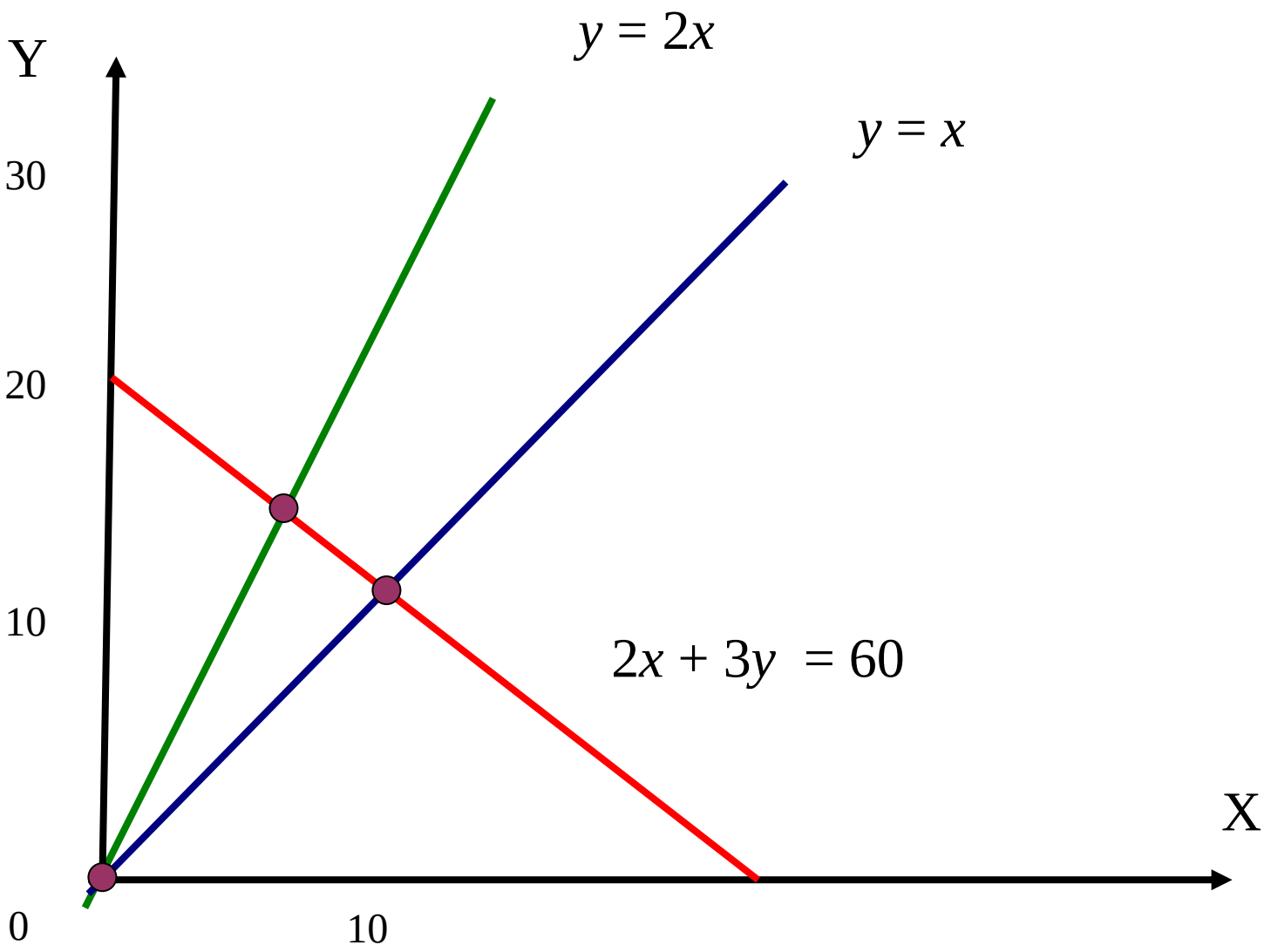
- Understanding the basic concepts of a spreadsheet, including:
  - the idea of templates
  - cells, rows and columns
  - cell coordinates
  - entering data into a spreadsheet cell
- Setting up labels, including:
  - setting column widths
  - aligning data in cells
  - entering column and row labels
- Creating and copying formulas
- Making changes in a spreadsheet
  - inserting rows and columns
  - deleting rows and columns

What is a function

- Quite simply, a ***function*** is a rule which takes certain values as input values and assigns to each input value exactly one output value.
- When a function is defined, we say that the output value is a function of the input value.
- The inputs and outputs of a function are called ***variables***.
- What makes a function linear ?

Linear Function

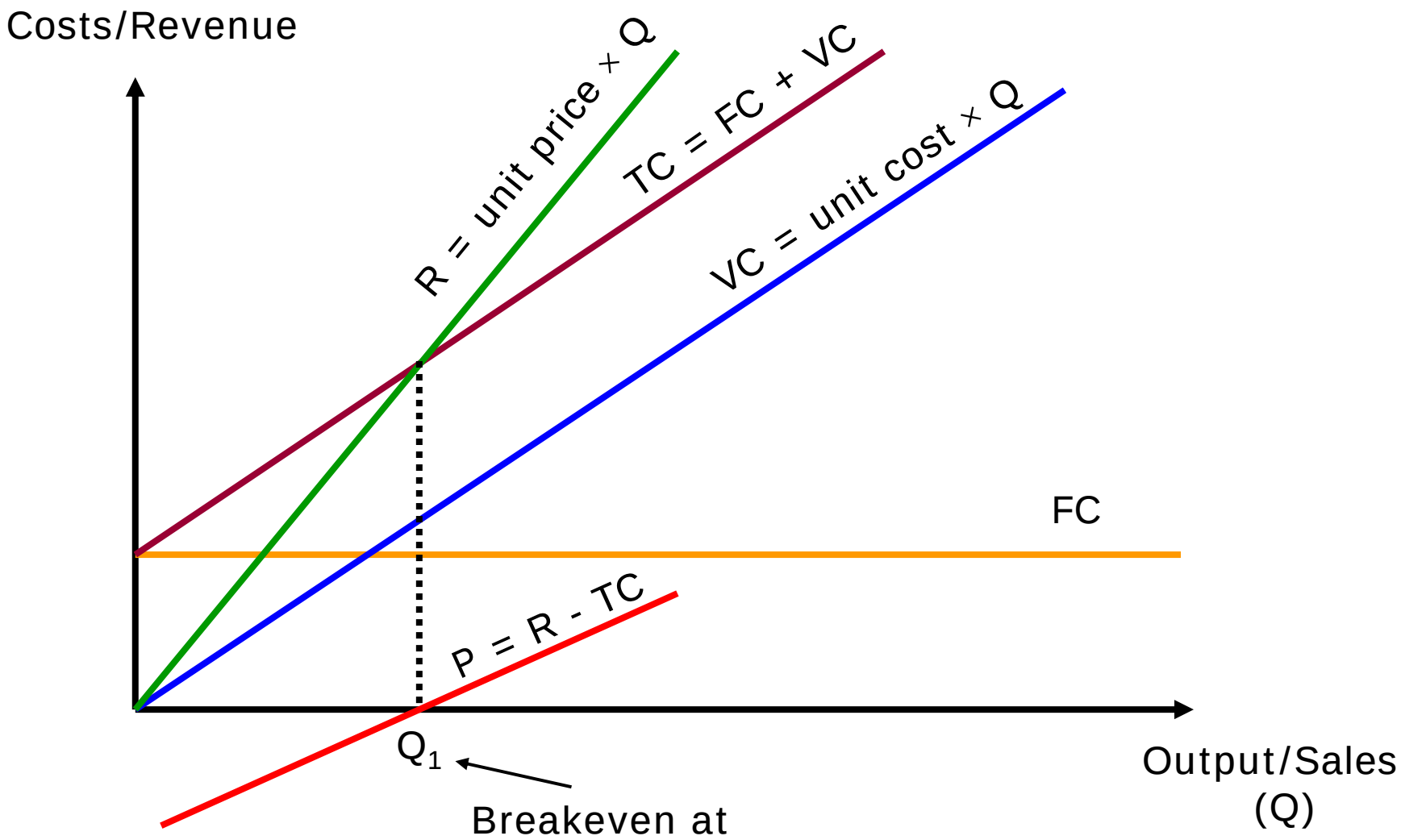



y = 2x
y = x
Y
30
20
10
0
10
X
2x + 3y = 60

Basic Concepts in Break Even Analysis

- **Costs**
  - Fixed costs
  - Variable costs = Unit cost ×Quantity Produced
  - Total cost = Fixed cost + Variable cost
- **Revenue = Price × Quantity Produced (Sold)**
- **Profit = Revenue – Cost**
- **Break even point (BEP)**
  - Profit = Revenue – Cost = 0

Break-Even Analysis



Example 1: Breakeven Analysis

Suppose that to develop and produce a new product will cost $100,000 in time and equipment, plus $3.50 per unit for labor and materials.

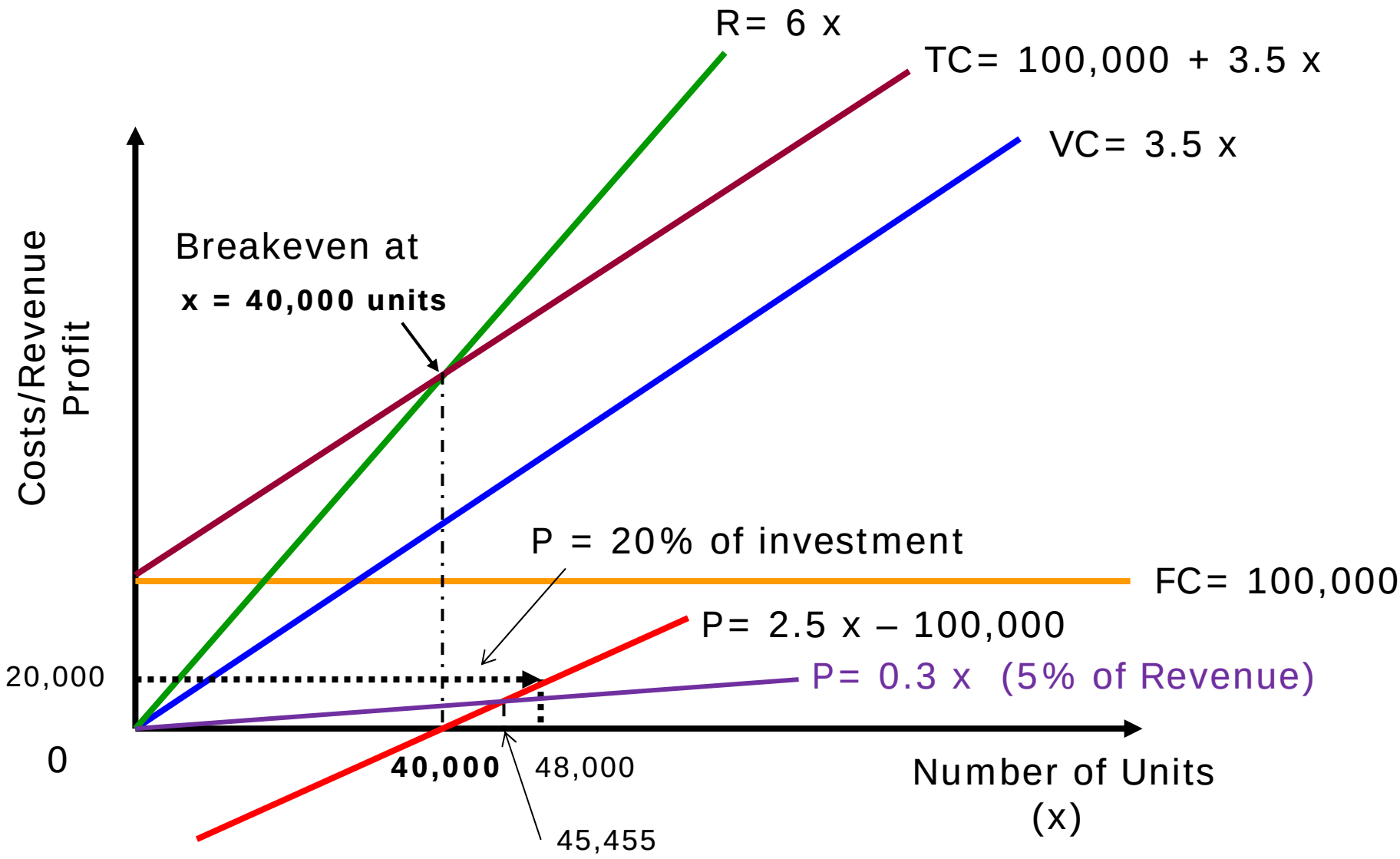
Question A: If the selling price is believed to be $6 for each unit. How many units?

1) For breakeven
2) To make a profit of 20% of our investment
3) To make a profit of 5% of revenue

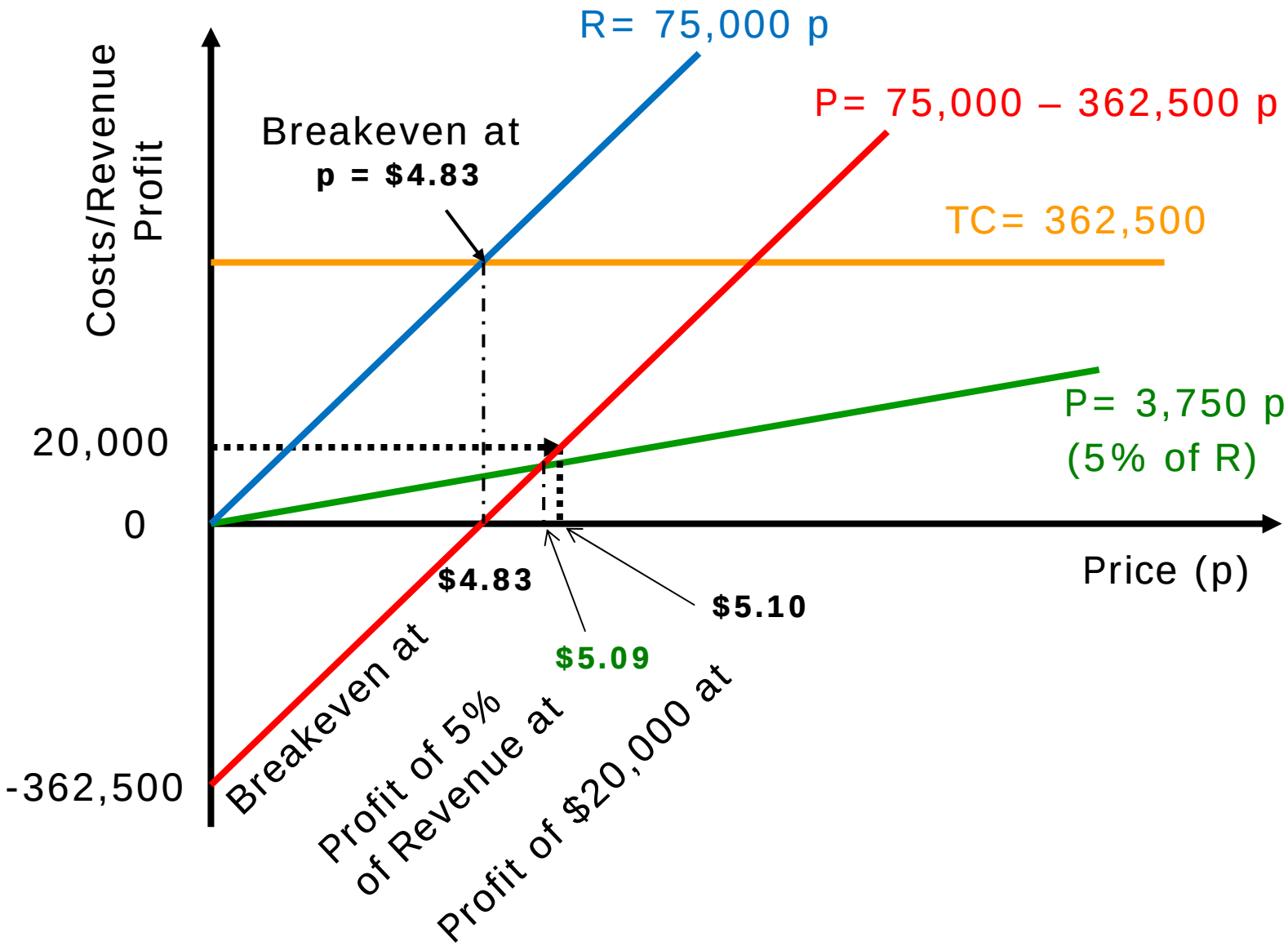
Question B: If we have 75000 units,. What's the selling price?

1) For breakeven
2) To make a profit of $20000
3) To make a return of at least 5% of revenue

Break-Even Analysis (Question A)



Break-Even Analysis (Question B)

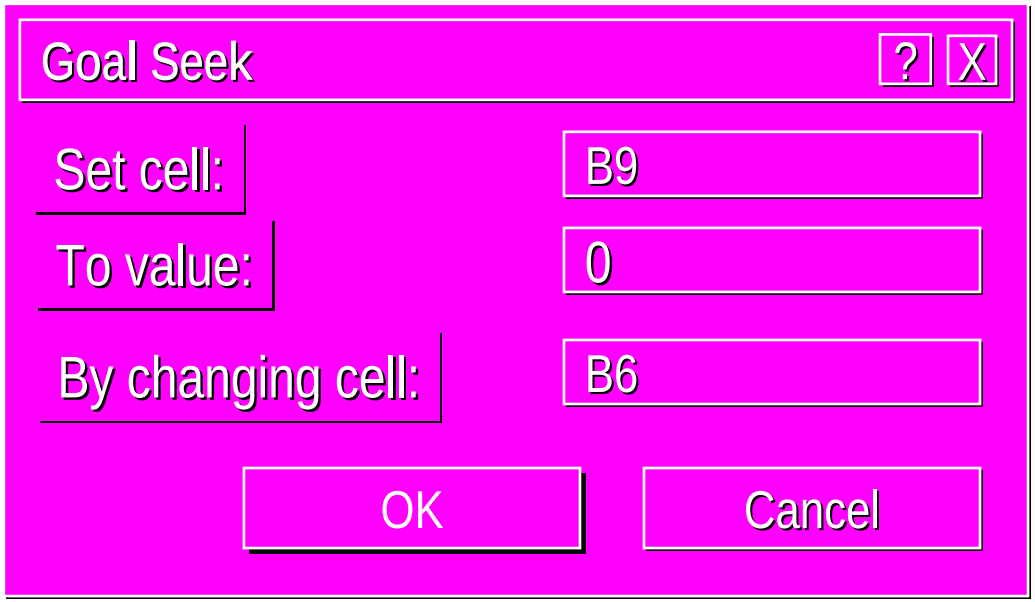


Goal Seek

Example: Use goal seek to solve Example 1, i.e. to answer:

a) Question A.

b) Question B.



Example 2: Make-Buy Decision

Suppose that you currently buy a part from a supplier for $1.20 per unit. You could buy the equipment and train personnel to do it yourself. Equipment and training would cost $80,000. You estimate that labor and materials would amount to $0.45 per unit.

- The savings per unit would be substantial, but is it worth spending $80,000?
- At what output is it cheaper to make the product rather than buying it?
- At what output you can make a profit of 20% of your investment?

Example 3: Capacity Planning

Suppose we have three options available:

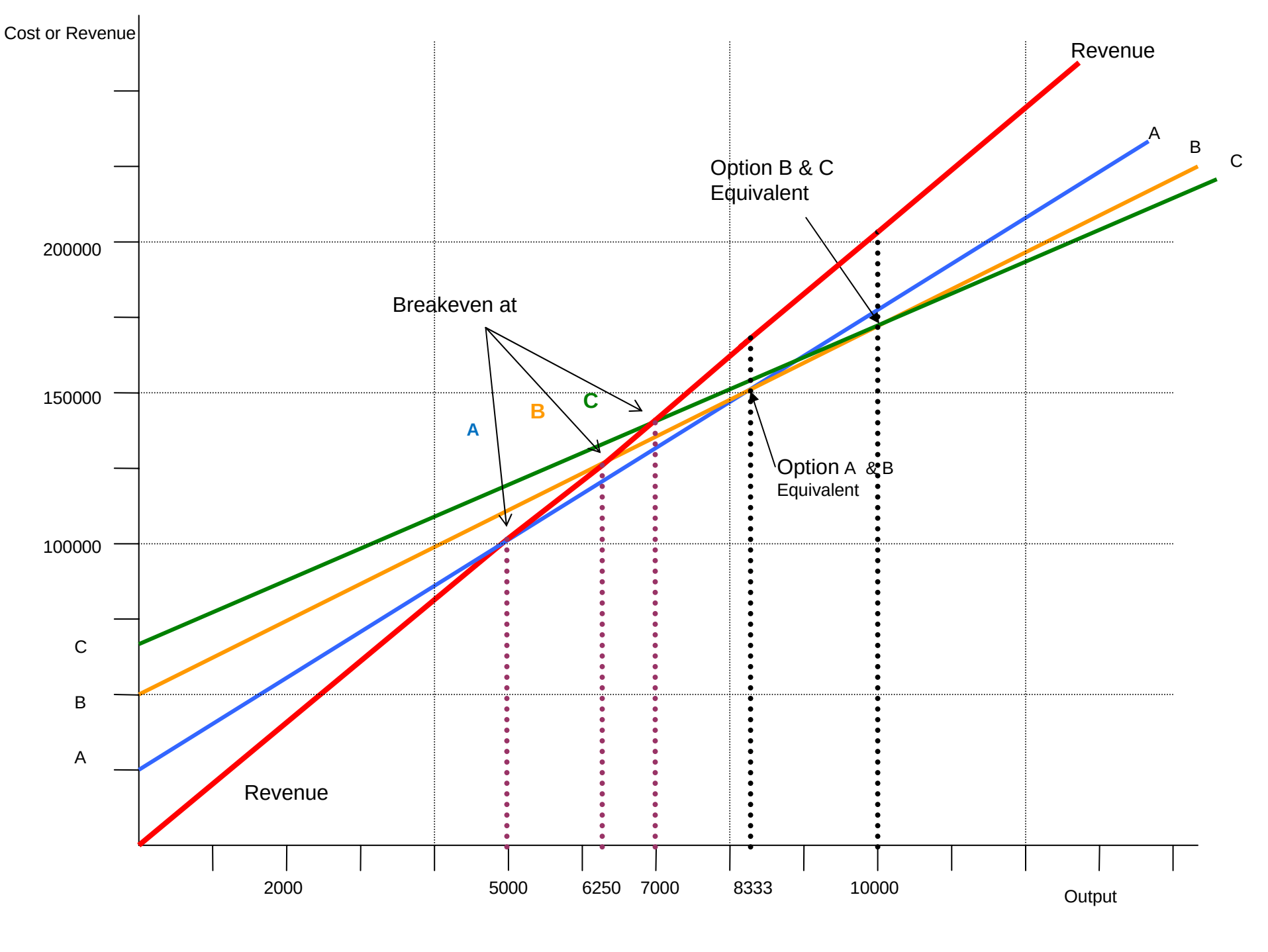
- ***Option A***: Purchase a used machine for $25,000 and have a variable cost of $15 per unit
- ***Option B***: Purchase a new machine for $50,000 with a variable cost of $12 per unit
- ***Option C***: Purchase a larger new machine for $70,000 with a variable cost of $10 per unit

The planned selling price is $20 per unit.

Question: what are break even points for the three options?

Let *x* represent the number of units made and sold.

Which option to choose?


Cost or Revenue
Revenue
A
B
C
Option B & C
Equivalent
200000
Breakeven at
150000
C
B
A
Option A & B
Equivalent
100000
C
B
A
Revenue
2000
5000
6250
7000
8333
10000
Output