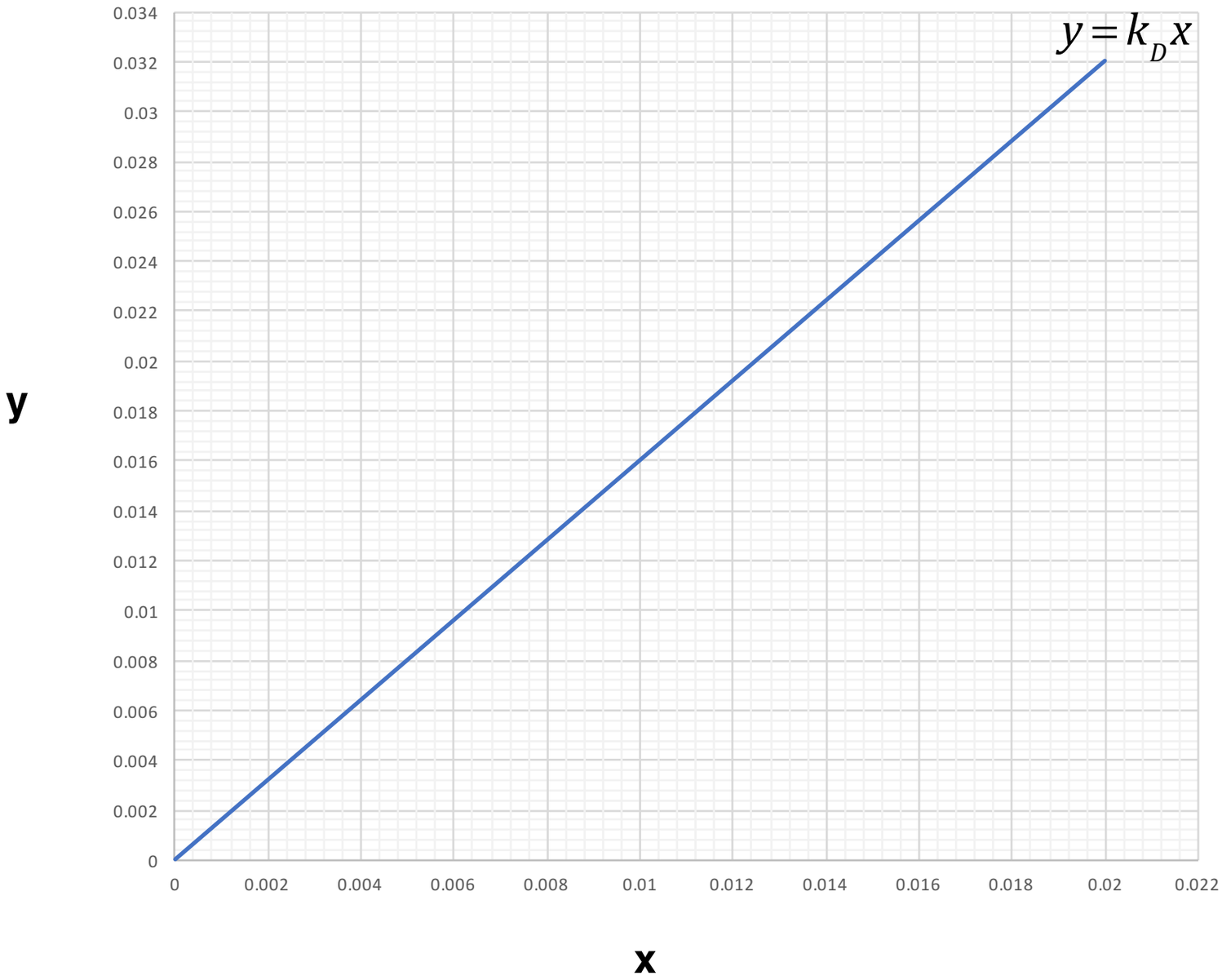
Exercise Problem 1

An aqueous solution of acetic acid is produced at 100 mol/min and contains 1.8 mole% acetic acid. We need to purify acetic acid so that only 0.2% of acetic acid is left in the aqueous solution. We decided to use liquid-liquid extraction (countercurrent mode), using 100% pure 1-butanol as a solvent, available at 80 mol/min. 1-butanol/water can be considered immiscible. Calculate the number of stages required by the graphical method. Calculate the concentration of acetic acid in 1-butanol in the extract at the exit.

$$k_D = 1.6$$

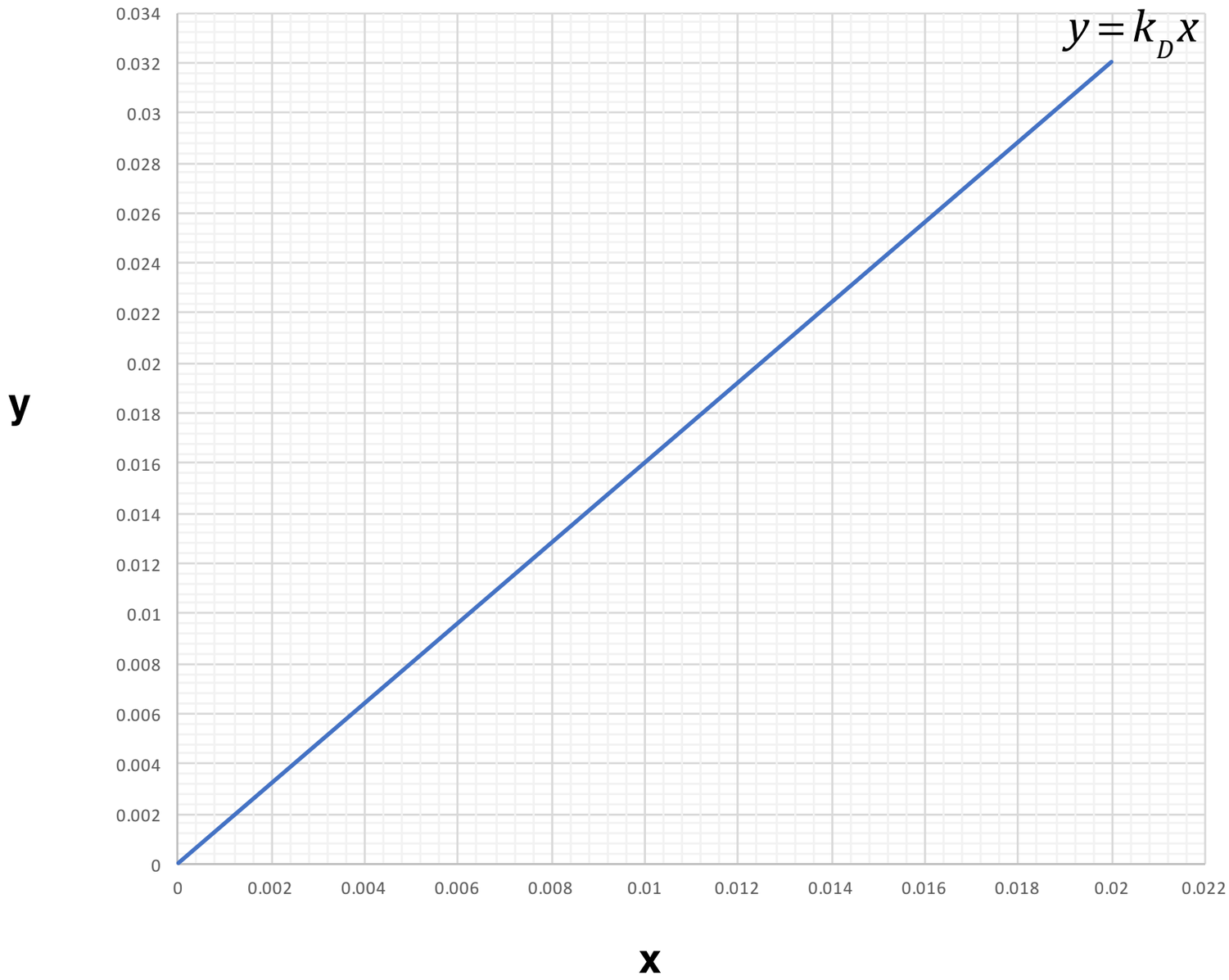


Exercise problem 2: Minimum solvent flow rate

An aqueous solution of acetic acid is produced at 100 mol/min and contains 1.8 mole% acetic acid. We need to purify acetic acid so that only 0.2% of acetic acid is left in the aqueous solution. We decided to use liquid-liquid extraction (countercurrent mode), using 100% pure 1-butanol as a solvent. 1-butanol/water can be considered immiscible.

Calculate the minimum possible flow rate of 1-butanol.

$k_D = 1.6$



Exercise problem 3

An aqueous solution of acetic acid is produced at 100 mol/min and contains 1.8 mole% acetic acid. We need to purify acetic acid so that only 0.2% of acetic acid is left in the aqueous solution. We decided to use liquid-liquid extraction (**cross-flow mode**), using **100% pure 1-butanol** as a solvent, available at **100 mol/min**. 1-butanol/water can be considered immiscible.

Calculate the number of stages required by the graphical method.
What is the total solvent flow rate that is needed?

$$k_D = 1.6$$