

## MATH 1121 (Calculus for Engineering Technology) Course Outline

### 1.3 Rectangular Coordinates

- Illustrate the following concepts:
  - rectangular coordinate system,
  - $x$ -axis,
  - $y$ -axis,
  - origin,
  - quadrants,
  - coordinates
- Examples:
  - (Example 1) Plot  $A = (2, 1)$  and  $B = (-4, -3)$ .
  - (Example 3) Three vertices of a rectangle are  $A = (-3, -2)$ ,  $B = (4, -2)$ ,  $C = (4, 1)$ . What is the fourth vertex?
- *Suggested homework: 1-9, 15-16, 21-24*

### 1.4 The Graph of a Function

- Definition of a function  $y = f(x)$ .
- Overview of the table method for plotting function graphs.
- Examples:
  - (Example 1) Graph  $f(x) = 3x - 5$ .
  - (Example 3) Graph  $y = 3x - 5$ .
  - (Example 4) Graph  $y = \sqrt{x + 1}$ .
  - (Example 6) Graph

$$f(x) = \begin{cases} 2x + 1 & x \leq 1 \\ 6 - x^2 & x > 1 \end{cases}$$

- *Suggested homework: 1-12, 37-40*

## 2.1 Some Basic Definitions

- Distance Formula
  - $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
  - (Example 2) Find the distance between  $(3, -1)$  and  $(-2, -5)$ .
- Slope Formula
  - $m = \frac{y_2 - y_1}{x_2 - x_1}$
  - (Example 3) Find the slope of the line joining  $(3, -5)$ ,  $(-2, -6)$ .
  - (Example 4) Find the slope of the line joining  $(3, 4)$ ,  $(4, -6)$ .
- Identify parallel/perpendicular lines by slopes.
  - Parallel:  $m_1 = m_2$
  - Perpendicular:  $m_1 = -\frac{1}{m_2}$
  - (Example 7) Prove that the triangle with vertices  $A = (-5, 3)$ ,  $B = (6, 0)$ , and  $C = (5, 5)$  is a right triangle.
- *Suggested HW: 1-20, 29-36*

## 2.2 The Straight Line

- Point-slope form
  - $y - y_1 = m(x - x_1)$
  - (Example 2) Find the equation of the line passing through  $(2, -1)$  and  $(6, 2)$ .
- Slope-intercept form
  - $y = mx + b$
  - (Example 4) Find the slope and  $y$ -intercept of the straight line with equation  $2y + 4x - 5 = 0$ .
- *Suggested HW: 1-21, 33-40*

## Remaining Topics

- 2.3 The Circle
- 2.4 The Parabola

- 2.5 The Ellipse
- 2.6 The Hyperbola
- 2.7 Translation of Axes
- 1.2 Algebraic Functions
- 3.1 Limits
- 3.2 The Slope of a Tangent to a Curve
- 3.3 The Derivative
- 3.4 The Derivative as an Instantaneous Rate of Change
- 3.5 Derivatives of Polynomials
- 3.6 Derivatives of Products and Quotients of Functions
- 3.7 The Derivative of a Power of a Function
- 3.8 Differentiation of Implicit Functions
- 3.9 Higher Derivatives
- 4.1 Tangents and Normals
- 4.4 Related Rates
- 4.5 Using Derivatives in Curve Sketching
- 4.6 More on Curve Sketching
- 4.7 Applied Maximum and Minimum Problems
- 4.8 Differentials and Linear Approximations
- 5.1 Antiderivatives
- 5.2 The Indefinite Integral
- 5.3 The Area Under a Curve
- 5.4 The Definite Integral
- 7.1 The Trigonometric Functions
- 7.2 Basic Trigonometric Relations
- 7.3 Derivatives of the Sine and Cosine Functions

- 7.4 Derivatives of the Other Trigonometric Functions
- 8.1 Exponential and Logarithmic Functions
- 8.2 Derivative of the Logarithmic Functions
- 8.3 Derivative of the Exponentials Function
- 9.1 The General Power Formula
- 9.2 Basic Logarithmic Form
- 9.3 Exponential Form
- 9.4 Basic Trigonometric Forms