

考試時間 50 分鐘，試題共五題，滿分 50 分。請在考試卷上以中文或英文盡量依序作答，請詳列計算過程，否則不予計分。需標明題號但不必抄題。考試卷務必寫學號、姓名，試題不必繳回。

1. (10 points) For each one of the following functions, sketch its graph and find the interval on which the function is increasing.

$$f(x) = |x + 1|, \quad g(x) = 2 - x^3, \quad h(x) = x^4, \quad k(x) = \frac{1}{x^2 + 1}.$$

2. (10 points) Assuming that f is an even function and g is an odd function, and both f and g are defined on the entire real line. Which of the following are even? odd? (建議用奇偶函數的代數定義來推論)

a. fg b. f^2 c. g^2 d. $f \circ g$ e. $g \circ f$ u. $f \circ f$ v. $g \circ g$

3. (10 points) (a) Sketch the graph of $\cos x$ over $[0, 2\pi]$.

(b) What are the values of $\cos x$ for

$$x = 0, \frac{1}{6}\pi, \frac{2}{6}\pi, \frac{3}{6}\pi, \frac{4}{6}\pi, \frac{5}{6}\pi, \frac{6}{6}\pi, \frac{7}{6}\pi, \frac{8}{6}\pi, \frac{9}{6}\pi, \frac{10}{6}\pi, \frac{11}{6}\pi, \frac{12}{6}\pi?$$

(c) Sketch the graph of $\cos\left(2\left(x - \frac{\pi}{2}\right)\right)$ over $[0, 2\pi]$.

4. (10 points) Let $y = f(x)$ represent the position y of a moving particle as a function of time x . Sketch a graph of f in the first quadrant that satisfies each one of the following statements:

(a) Moving forward with a constant (nonzero) speed.

(b) Moving backward and speeding up.

(c) Moving forward, speeding up and then slowing down.

(d) Moving forward, slowing down and then speeding up.

(e) Not moving at all.

5. (10 points) Sketch the graph of $f(x) = x(1 - x)$ over $[0, 1]$. Refer to the graph and, without making any computations (不必計算但是要以圖示說明), find:

(a) The average rate of change over $[0, 1]$.

(b) The instantaneous rate of change at $x = 1/2$.

(c) The values of x at which the rate of change is positive.