

考試時間 50 分鐘，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. (5 points) A 6-ft man walks away from a 15-ft lamppost at a speed of 3 ft/s. Find the rate at which his shadow is increasing in length.
2. (5 points) Show that $f(x) = x^3 - 2x^2 + 2x$ is an increasing function.
3. (5 points) Sketch the graph of a continuous function on $(0, 4)$ having a local minimum but no absolute minimum.
4. (5 points) The following figure shows the graph of the *derivative* $f'(x)$ on $[0, 1]$. Locate values of x where the local extrema and points of inflection of $f(x)$ occur.

5. (10 points) (a) Find the linearization of $f(x) = \tan x$ at $x = \pi/4$.
(b) Use the approximation $\pi/4 \approx 0.7854$ and the linearization to estimate $\tan(0.8)$. Given that $\tan(0.8) = 1.029638\dots$, what is the *error* of your estimate?

(背面還有)

6. (10 points) A rectangular poster of area 6 ft^2 has blank margins of width 6 in. on the top and bottom and 4 in. on the left and right sides. Find the dimensions that maximize the printed area. (1 ft=12 in.)

7. (10 points) Match the functions (a)–(e) with the graphs (1)–(6).

$$(a) y = \frac{1}{x^2 - 1} \quad (b) y = \frac{1}{x^2 + 1} \quad (c) y = \frac{x^2}{x^2 + 1}$$

$$(d) y = \frac{x}{x^2 - 1} \quad (e) y = \frac{3x^2}{x^2 - 1}$$