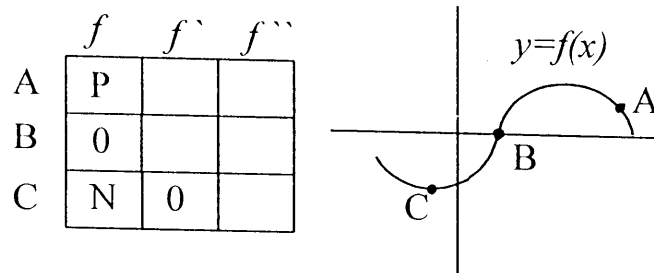


- [1] The monthly payment on an \$10,000 3-year car loan is a function  $f(r)$  of the interest rate  $r\%$ . Now  $f(16)=351.57, f'(16)=4.94$ . If the interest rate is 16.5%, approximately, how large is the monthly payment? (5%)

- [2] Refer to the graph. Fill in each entry of the grid with P(for positive), N(for Negative) or 0. (5%)



- [3] 請寫出統計學中所謂的「母體」(population)、「樣本」(sample)、「母體參數」(parameter)及「變數」(variable of interest)的基本定義。並舉出一實際應用例子說明之。 (10%)

- [4] Solve the recurrence equations:  $T(n)=2T(n/2)+n-1, T(0)=1$  (10%)

- [5] An apple orchard produces a profit of \$40 a tree when planted with 1,000 trees. Because of overcrowding, the profit per tree is reduced by 2 cents for each additional tree planted. How many trees should be planted in order to maximize the total profit from the orchard? (5%)

- [6] Six students take a statistics test in a row of desks, with an aisle at each end of the row. They leave their answer sheets on their own desks and go directly to one of the two aisles when they finish the test, in a random order. What is the probability that all the students go to one of the two aisles without passing by another student still taking the test? (10%)

- [7] 媚媚女子塑身美容公司宣稱參加該公司塑身計劃的女性可在參加一週後平均減去至少 7 磅的體重。消基會為此進行了一次顯著水準為 0.05( $\alpha=0.05, Z_{\alpha}=1.645$  &  $Z_{\alpha/2}=1.96$ )的假設檢定，經由隨機抽樣調查，消基會蒐集了 64 位媚媚公司塑身計劃參加者參加一週後的實際減重成果，此一隨機樣本的平均值為 6.15 磅而標準差為 3.12。請問：①此次檢定之虛無及對立假設為何？②請依據以上資料進行假設檢定，並說明消基會對媚媚公司的宣稱該下何種結論？ (15%)

- [8] 一盒子中裝有相同的小燈泡兩打，其中有 5 個是壞的。現從盒中隨機取出 6 個小燈泡(同時)，請問：①其中只有兩個壞的小燈泡的機率是多少？②又其中至少有兩個壞燈泡的機率為何？ (10%)

- [9] Differentiate the following functions: (10%)

a.  $g(x)=(x+1)(x+2)^2(x+3)^3(x+4)^4(x+5)^5$  (5%)

b.  $f(x)=\sqrt{x+\sqrt{x}}$  (5%)

- [10] Find the integrals: (10%)

a.  $\int \frac{\ln \sqrt{x}}{x} dx$  (5%)

b.  $\int x^2 \ln x dx$  (5%)

- [11]  $A$  is a matrix. Find  $A^{100}$ , if (10%)

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$$