

數值方法作業 HW8

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Q1:

- a. Polynomial degree 2 approximation:  
 $y = 3.0864 + -1.8837x + 6.6912x^2$   
Error = 0.005246
- b. Exponential approximation ( $y = b * e^{(a * x)}$ ):  
 $y = 22.8245 * \exp(0.3867 * x)$   
Error = 74.360788
- c. Power approximation ( $y = b * x^n$ ):  
 $y = 6.2335 * x^{2.0202}$   
Error = 0.010270

Q2:

Least Squares Polynomial Approximation (degree 2):  
 $P_2(x) = 0.4983 + 0.3263x + -0.2326x^2$   
L2 Error = 0.003241

Q3:

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=== (a) Trigonometric Least Squares Polynomial  $S_4(x)$  ===  
 $S_4(x) = (a_0)/2 + \sum [a_k \cos(2\pi k x) + b_k \sin(2\pi k x)], k=1\sim 4$   
a0/2 = 0.395344  
a1 = 0.072827  
b1 = -0.237249  
a2 = -0.022262  
b2 = -0.123859  
a3 = -0.038390  
b3 = -0.077809  
a4 = -0.043865  
b4 = -0.052223  
  
=== (b)  $\int_0^1 S_4(x) dx \approx 0.197672$   
=== (c)  $\int_0^1 x^2 \sin(x) dx \approx 0.223244$   
=== (d) Error  $E(S_4) \approx 0.013995$ 
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