Homework assignment 1:
Due date: Saturday, September 5, 2020 at 11:59pm

1. Compute the values for

   a. $\sum_{i=-1}^{4} 3$

   b. $\sum_{i=1}^{5} \left(\frac{1}{3}\right)^i$

   c. $\sum_{i=1}^{n} 3$

   d. $\sum_{i=-3}^{n} 3$

   e. $\sum_{k=0}^{n} 2^k + \sum_{k=5}^{n} 2^k$

   f. $\sum_{i=0}^{n} \left(\frac{2}{3}\right)^i + \sum_{i=-4}^{n} \left(\frac{2}{3}\right)^i$

   g. $\sum_{i=1}^{n} (i^3 + 2i^2 - i + 1)$

   h. $\sum_{i=5}^{n} (-4i + \frac{i}{5})$

   i. $\sum_{j=0}^{k} \sum_{i=1}^{j} (i - j^2 - 2)$

   j. $\sum_{j=1}^{m} \sum_{k=1}^{j} (3C + k - 3j + i)$

   k. $\sum_{l=-4}^{n} \sum_{j=1}^{k} \sum_{i=1}^{j} (i - 4)$

2. Calculate the answer (do not use any calculators) (**log3=1.5**)

   a. $\log_4 x = 5 \rightarrow x = ?$

   b. $\log_3 y = 4 \rightarrow y = ?$

   c. $x = 7^2 \rightarrow \log_7 x = ?$

   d. $x = 32 \rightarrow \log x = ?$

   e. $2^{\log 5} + 4^{\log 6} - 27^{\log_3 5}$

f. $9^{\log_3 2} - 25^{\log_5 4} - 36^{\log_6 7} + 8^{\log_8 6}$

g. $\log(4^5 \times 8^3) - \log(16-8) + \log(\frac{2^{10}}{4 \times 3^2})$

h. $\log(3^2 \times 64^3) - \log(\frac{2^{10} \times 128^3}{9 \times 8^2})$

i. $\log\log 16$

j. $\log 16 \times \log 16$ Compare your answer with part i.

k. $\log^2 16$ Compare your answer with parts j and i.

l. $\log_2 \log_5 625 - \log_3 \log_4 2^{3^9} + \log^4 2^5 - \frac{\log^2(4^3 \times 3^5)}{\log_5 125}$

m. $\log\log_8 \log 256 + \log^5(3^2) \times 4^{\log 7}$

n. $\log_6 x = 5 \rightarrow \log_x 6 \ = ?$

o. $\log_y x = 10 \rightarrow \log_x y \ = ?$

p. $\log_4 32 - \log_8{}^2 4$

q. $\log_4 8 + \log_9 27 - \log_{25}{}^2 125 - \log_8{}^3 16 + \log_4 \log 256$

3. Compute the derivative of

a. $-5x^3 + 2x - 1$

b. $3x^4 - 2\sqrt{x} + x^{1/2} - 6x^{-2/3} - 5$

c. $x\sqrt{x} + \sqrt{\sqrt{x}}$

d. $\log x - x^2 \ln x + \ln x^4$

e. $\ln^3(x\sqrt{2x-3}) + \sqrt{\ln x^2}$

f. $\frac{\sqrt[4]{x+5} - \ln x}{(x-1)^3}$

4. Determine the limit of

a. $\lim_{x \longrightarrow \infty} \frac{3x+2}{-5x-6}$

b. $\lim_{x \longrightarrow \infty} (\frac{1}{x} + 3)$

c. $\lim_{x \longrightarrow \infty} \frac{3x \log x + 2}{\sqrt{x^3} + 7x}$

d. $\lim_{x \longrightarrow \infty} \frac{x^3 + x - \sqrt{3x}}{\sqrt{x}}$

e. $\lim_{x \longrightarrow \infty} \frac{x^3 + x - \sqrt{3x}}{5x^{2.25}\sqrt{\sqrt{x}}}$

f. $\lim_{x \longrightarrow \infty} \frac{x^{0.1} - \sqrt{3}}{\sqrt{\sqrt{x}}}$

g. $\lim_{x \longrightarrow \infty} \frac{x^x}{2^x}$

h. $\lim_{x \longrightarrow \infty} \frac{x^x}{x(2^x)}$

i. $\lim_{x \longrightarrow \infty} \frac{\log x^{\log x}}{x^{1/5}}$

j. $\lim_{x \longrightarrow \infty} \frac{\sqrt{2}^{\log^4 x^3}}{\log(2x+7)}$

k. $\lim_{x \longrightarrow \infty} \frac{\frac{x+1}{3x^{\ln x}}}{2x^2}$

l. $\lim_{x \longrightarrow \infty} \frac{\sqrt{2}^{\log x^3}}{\log^{\ln x}(2x)}$

5. Compute the exact values for

   a. $\int_1^n (2x^4 + 5\sqrt{x})dx$

   b. $\int_1^n (x^4 - 3x^2 + \frac{1}{x} - \frac{1}{x^2})dx$

   c. $\int_1^n (\frac{3}{\sqrt{x}} + \ln x + e^x)dx$

   d. $\int_1^n xe^x dx$

   e. $\int_1^n (x\ln x - 4\ln x)dx$

   f. $\int_1^n x\sin x dx$

6. Use mathematical induction to prove that

$$1 + 2 + \cdots + n = \frac{n(n+1)}{2}$$

7. Use mathematical induction to prove that

$$1 + 2^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$$