MATH 120 In-class Activity
Day 20

Question 1. Practice using sigma notation.

(a) Convert the following sigma notation expressions to expressions involving addition.

(i) $\displaystyle\sum_{j=3}^{\infty} \frac{1}{j^3}$

(ii) $\displaystyle\sum_{k=-5}^{25} \sin(k\pi)$

(b) Convert the following expressions involving addition to sigma notation.

(i) $\overbrace{10^{100} + 10^{100} + \cdots + 10^{100}}^{82}$

(ii) $-21 - 10 + 1 + 12 + \ldots + 111$

(iii) $-1 - 3 - 9 - 27 - \ldots - 177147$

Question 2. Practice using product notation.

(a) Convert the following product notation expressions to expressions involving multiplication.

(i) $\displaystyle\prod_{k=0}^{5}(100 + k)$

(ii) $\displaystyle\prod_{i=2}^{\infty} \frac{(i-1)^2}{i^2 + 1}$

(iii) $\displaystyle\prod_{j=m}^{n}(2j + 1)$

(b) Convert the following expressions involving multiplication to product notation.

(i) $6 \cdot 10 \cdot 14 \cdot 18 \cdot \ldots \cdot 1002$

(ii) $(-16) \cdot (40) \cdot (-100) \cdot (250) \cdot (-625)$

(iii) $\dfrac{1}{4} \cdot \dfrac{3}{9} \cdot \dfrac{5}{16} \cdot \dfrac{7}{25} \cdot \dfrac{9}{36} \cdot \ldots$

Question 3. Give a value for the following expressions, if it exists.

(i) $.001 + .002 + .003 + .004 + \cdots$

(ii) $3 + 6 + 12 + 24 + 48 + \cdots + 3 \cdot 2^n$

(iii) $\displaystyle\sum_{i=1}^{10} k^2$ (Careful!)

(iv) $\displaystyle\sum_{i=60}^{100} i$

(v) $\displaystyle\prod_{i=60}^{100} i$

(vi) $\displaystyle\prod_{n=0}^{\infty} (-1.00001)^n$

Question 4. Show that $\displaystyle\prod_{i=1}^{n} (2i-1) = \frac{(2n)!}{2^n \cdot n!}$.

[*Hint 1: First understand the left hand side of the equation.*]

[*Hint 2: Try a couple of values of n to understand the pattern.*]