Bell Work

$$\lim_{x \to \infty} \left(\frac{5x^3 + 2x^2}{11x^3 + 1} \right)$$

PRE-CALC TRIG

Day 75

From Last Time

Page 887 # 9, 13, 17, 23

Do we need to talk more about the notes?

12.5 The Area Problem

Objective: To find limits of summations

Limits of Summations

$$\sum_{i=1}^{n} c = \text{cn}, \qquad \text{c is a constant}$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

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

$$\sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}$$

Limits of Summations

$$\sum_{i=1}^{n}(a_i \pm b_i) = \sum_{i=1}^{n} a_i \pm \sum_{i=1}^{n} b_i$$

$$\sum_{i=1}^{n} ka_i = k\sum_{i=1}^{n} a_i\,, \qquad k \text{ is a constant}$$

Examples

$$\sum_{i=1}^{10} 5$$

$$\sum_{i=1}^{5} i$$

$$\sum_{i=1}^{8} i^2$$

$$\sum_{i=1}^{12} 7i^3$$

Examples (solutions)

$$\sum_{i=1}^{10} 5 = 5 * 10 = \mathbf{50}$$

$$\sum_{i=1}^{5} i = \frac{5(5+1)}{2} = \mathbf{15}$$

$$\sum_{i=1}^{8} i^2 = \frac{8(8+1)(2(8)+1)}{6} = \mathbf{204}$$

$$7\sum_{i=1}^{12} i^3 = \frac{12^2(12+1)^2}{4} = 6084$$

$$7(6084) = \mathbf{42588}$$

Example. Simplify. Then evaluate the following.

$$\sum_{i=1}^{n} \frac{i+5}{n^2}$$

$$\sum_{i=1}^{100} \frac{i+5}{n^2}$$

$$\sum_{i=1}^{1000} \frac{i+5}{n^2}$$

$$\sum_{i=1}^{10,000} \frac{i+5}{n^2}$$

Example. Simplify. Then evaluate the following.

$$\sum_{i=1}^{n} \frac{i+5}{n^2} = \frac{1}{n^2}\sum_{i=1}^{n}(i+5) = \frac{1}{n^2}(\sum_{i=1}^{n} i + \sum_{i=1}^{n} 5) = \frac{1}{n^2}\left(\frac{n(n+1)}{2} + 5n\right) = \left(\frac{n(n+1)}{2n^2} + \frac{5n}{n^2}\right)$$

$$\left(\frac{n+1}{2n} + \frac{5}{n}\right) = \left(\frac{n+1}{2n} + \frac{10}{2n}\right) = \left(\boldsymbol{\frac{n+11}{2n}}\right)$$

$$\sum_{i=1}^{100} \frac{i+5}{i^2} = \frac{100+11}{2(100)} = 0.555 \qquad \sum_{i=1}^{1000} \frac{i+5}{i^2} = \frac{1000+11}{2(1000)} = 0.5055 \qquad \sum_{i=1}^{10{,}000} \frac{i+5}{i^2} = \frac{10{,}000+11}{2(10{,}000)} = 0.50055$$

Extra: Could we apply this to a limit as it approaches infinity?

$$\lim_{x \to \infty} \left(\frac{n + 11}{2n} \right) = \frac{\frac{n}{n} + \frac{11}{n}}{\frac{2n}{n}} = \frac{1 + 0}{2} = \frac{1}{2}$$

Does this hold up with what we were noticing as our n value got larger?

For Next Time…

$page\ 896\ \#\ 5 - 11, 13, 16$