MA 16020 Quiz 8 (Lessons 16-17)

Write your name, section number (054 for 11:30, 039 for 12:30), and quiz number on the top of your quiz, **front and back.**

You may use a one-line calculator.

1. Compute
$$\sum_{n=3}^{\infty} \frac{5^{2n+2}}{6^{2n}}.$$

2. A patient takes 300 mg of certain drug every day. At the same time, after each day only 40% of the overall amount of the drug in the body remains. Assuming that the patients takes the drug indefinitely, what is the eventual amount of drug in his system right before taking a new dose of the drug?

1. $\sum_{n=3}^{\infty} \frac{5^{2n+2}}{6^{2n}} = \sum_{n=3}^{\infty} 5^2 \left(\frac{5}{6}\right)^{2n} = \sum_{n=3}^{\infty} 25 \cdot \left(\frac{25}{36}\right)^n = 25 \cdot \left(\frac{25}{36}\right)^3 + 25\left(\frac{25}{36}\right)^4 + \dots$

$= \sum_{n=0}^{\infty} 25 \cdot \underbrace{\left(\frac{25}{36}\right)^3}_{a} \underbrace{\left(\frac{25}{36}\right)^n}_{q} = \frac{25 \cdot \left(\frac{25}{36}\right)^3}{1 - \frac{25}{36}} = \frac{\frac{25^4}{36^3}}{\frac{11}{36}} =$

$= \frac{25^4}{36^2 \cdot 11} \approx 27.4$

2. Amount of drug $= \underbrace{300 \cdot (0.4)}_{\text{dose from yesterday}} + \underbrace{300 \cdot (0.4)^2}_{\text{dose from 2 days ago}} + 300 \cdot (0.4)^3 + \dots$

$= \sum_{n=0}^{\infty} 120 + 120 \cdot (0.4) + 120 \cdot (0.4)^2 + \dots$

$= \sum_{n=0}^{\infty} 120 \cdot (0.4)^n = \frac{120}{1 - 0.4} = \frac{120}{0.6} = \frac{1200}{6} = 200 \text{ mg}$