1. (4 points) Find the sum of the infinite series

\[ 2 + \left(\frac{2}{3}\right)^2 + \left(\frac{2}{3}\right)^3 + \cdots + \left(\frac{2}{3}\right)^n + \cdots \]

2. (4 points) Does the infinite series \( \sum_{n=1}^{\infty} \frac{n^3}{n^5 + 1} \) converge? Explain why or why not.

3. (8 points) If the fourth degree Taylor polynomial approximating a function \( f \) near \( x = -1 \) is

\[ P_4(x) = 2 - 3(x + 1) - (x + 1)^3 + 4(x + 1)^4, \]

then

(a) The linear approximation to \( f \) near \( x = -1 \) is ____________________________.

(b) \( f'''(-1) = ____________________________ \).