

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)  $f'''(-1) =$  \_\_\_\_\_.