

3. [13 points] A function  $g(x)$  has Taylor series centered at  $x = 5$  given by

$$\sum_{n=0}^{\infty} \frac{(-1)^n (x-5)^{n+1}}{(n+1) \cdot 4^n}.$$

a. [2 points] Is  $g(x)$  increasing or decreasing near  $x = 5$ ? Briefly justify your answer.

b. [3 points] Find  $g^{(1001)}(5)$ .

$$g^{(1001)}(5) = \underline{\hspace{2cm}}$$

c. [8 points] Given that the radius of convergence of this Taylor series is 4 (do NOT show this), find the **interval** of convergence of this Taylor series. Show all your work, including full justification for series behavior.

Interval of convergence:  $\underline{\hspace{2cm}}$