1. [12 points] The parts of this problem are unrelated. You do not need to justify your answers.

    a. [6 points] For each of the following sequences, defined for $n \geq 1$, decide if it is bounded, if it is increasing or decreasing, and whether it converges, and circle your answers. If it converges, find the limit.

      i. $b_n = \dfrac{2n + e^{-n}}{5n}$ **Bounded**   **Increasing**   **Decreasing**

                                                Diverges   **Converges to** _____

      ii. $c_n = \sin(n)$ **Bounded**   **Increasing**   **Decreasing**

                                                Diverges   **Converges to** _____

      iii. $d_n = \displaystyle\sum_{k=1}^{n} \dfrac{3}{k}$ **Bounded**   **Increasing**   **Decreasing**

                                                Diverges   **Converges to** _____

    b. [3 points] Write the following series using sigma notation:

$$2^3(x - e)^4 + 3^3(x - e)^6 + 4^3(x - e)^8 + \ldots$$

                                    Answer: _____

    c. [3 points] Suppose the power series $\displaystyle\sum_{n=0}^{\infty} C_n(x - 2)^n$ converges at $x = 5$ and diverges at $x = 9$. Which of the following could be the radius of convergence R? Circle <u>all</u> correct answers.

      $R = 0$ $R = 2$ $R = 3$ $R = 4$ $R = 7$ $R = 8$ $R = 10$