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** **2/5**

ii. $c_n = \sin(n)$

Bounded **Increasing** **Decreasing**

Diverges **Converges to** _____

iii. $d_n = \displaystyle\sum_{k=1}^{n} \frac{3}{k}$

Bounded **Increasing** **Decreasing**

Diverges **Converges to** _____

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

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

Answer: $\displaystyle\sum_{n=2}^{\infty} n^3(x-e)^{2n} = \sum_{n=1}^{\infty}(n+1)^3(x-e)^{2(n+1)}$

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 all correct answers.

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