MATH 202, Fall 2023 **Name:** _____

In class work 16 **Row and Seat:** _____

"The place to improve the world is first in one's own heart and head and hands, and then work outward from there." ROBERT M. PIRSIG

In class work **16** has questions **1** through **3** with a total of **7** points. Turn in your work at the end of class *on paper*. This assignment is due *Tuesday 24 October 13:20*.

1. Define a function F by $F(x) = \frac{\ln(x)}{\left(\frac{4}{3}\right)^x}$.

[1] (a) Use Desmos to graph $y = F(x)$ for $2 \le x \le 15$. Reproduce the graph here. Based on the graph, what is your guess for the numeric value of $\lim_{x\to\infty} \frac{\ln(x)}{\left(\frac{4}{3}\right)^x}$?

[1] (b) Use Desmos to graph $y = \frac{F(x+1)}{F(x)}$ for $2 \le x \le 15$. Reproduce the graph here. Based on the graph, what is your guess for the numeric value of $\lim_{x\to\infty} \frac{F(x+1)}{F(x)}$?

[1] (c) Use the l'Hôpital rule to find the numeric value of $\lim_{x\to\infty} \frac{F(x+1)}{F(x)}$.

1 (d) Use the *ratio test* to determine if the series $\sum_{k=2}^{\infty} F(k)$ converges or diverges.

2. Use the *ratio test* to determine if each series converges or diverges.

1 (a) $\sum_{k=0}^{\infty} \frac{2^k}{3^k + 8}$

1 (b) $\sum_{k=0}^{\infty} \frac{((k)!)^3}{(3k)!} 14^k$

1 3. Find the numeric value of the $\lim_{k\to\infty} \frac{((k)!)^3}{(3k)!} 14^k$. Justify your answer.