Midterm 2
Math 253
March 1, 2024 Name: _____

Each problem is worth 10 points, for a total of 60 points.
You may use a hand-written sheet of notes.
Show your work where appropriate.
No calculators or cheating.

1. Does $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}-1}$ converge or diverge, and why?

2. Does $\sum_{n=1}^{\infty} \frac{\ln n}{n^2}$ converge or diverge, and why?

3. Does $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{n^{3/2}}$ converge absolutely, conditionally, or not at all, and why?

4. Does $\sum_{n=0}^{\infty} \frac{2^n}{n!}$ converge or diverge, and why?

5. Find the third Taylor polynomial of the function $f(x)=\sin 2x+\cos x$, that is,
the polynomial of degree 3 whose value and first three derivatives at zero agree with those of f.

6. For which values of x does the series $\sum_{n=0}^{\infty} \frac{x^n}{n+1} = 1 + \frac{x}{2} + \frac{x^2}{3} + \frac{x^3}{4} + \cdots$ converge?