Only the answer sheets will be graded. Please write your name and section number on every page. Please circle final answers and cross out incorrect work. You must justify all answers to receive full credit. You may not use calculators, notes, or any other kinds of aids.

1. (10 points) Determine whether the sequence $a_n = \cos(2/n)$ converges.

2. (15 points each) Determine whether each series converges or diverges.

\begin{align*}
\text{(a)} \quad & \sum_{n=1}^{\infty} \frac{(-1)^n n}{n^2 + 1} \\
\text{(b)} \quad & \sum_{n=2}^{\infty} \frac{1}{\sqrt{n}(n-1)}
\end{align*}

3. (15 points) Find the sum of the series $1 - \frac{1}{1!} + \frac{1}{2!} - \frac{1}{3!} + \ldots$.

4. (15 points) Find the radius and interval of convergence for the series $\sum_{n=0}^{\infty} \sqrt{n}(x-2)^n$.

5. (15 points) Find (in sigma summation notation) the power series expansion at $a = 0$ of the function $\frac{x}{1 + x^3}$.

6. (15 points) Find the Taylor polynomial $T_3(x)$ of the function $f(x) = \sqrt{x}$ at the expansion point $a = 4$.

\[\frac{d}{dx} (\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}\]
\[\frac{d}{dx} (\tan^{-1} x) = \frac{1}{1+x^2}\]
\[1 - \sin^2 \theta = \cos^2 \theta\]
\[1 + \tan^2 \theta = \sec^2 \theta\]
\[\sin^2 \theta = \frac{1}{2}(1 - \cos 2\theta)\]
\[\cos^2 \theta = \frac{1}{2}(1 + \cos 2\theta)\]

"I’ve decided to forego trigonometry, and make myself eligible for the NBA draft."