MATH 242, Fall 2006
Exam 3: December 1, 10:10-11:00

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.

   (a) $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{n}{n^2+1}$ (b) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{\sqrt{n}(n-1)}$
3. (15 points) Find the sum of the series $1 - \dfrac{1}{1!} + \dfrac{1}{2!} - \dfrac{1}{3!} + \cdots$.
4. (15 points) Find the radius and interval of convergence for the series $\displaystyle\sum_{n=0}^{\infty} \sqrt{n}(x-2)^n$.
5. (15 points) Find (in sigma summation notation) the power series expansion at $a = 0$ of the function $\dfrac{x}{1+x^3}$.
6. (15 points) Find the Taylor polynomial $T_3(x)$ of the function $f(x) = \sqrt{x}$ at the expansion point $a = 4$.

$$\frac{d}{dx}\left(\sin^{-1} x\right) = \frac{1}{\sqrt{1-x^2}}$$
$$\frac{d}{dx}\left(\tan^{-1} x\right) = \frac{1}{1+x^2}$$
$$1 - \sin^2\theta = \cos^2\theta$$
$$1 + \tan^2\theta = \sec^2\theta$$
$$\sin^2\theta = \tfrac{1}{2}(1 - \cos 2\theta)$$
$$\cos^2\theta = \tfrac{1}{2}(1 + \cos 2\theta)$$

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