Practice Midterm Exam (110pts)
Math 214

Your name:_____ ID#:_____

1.(40 pts) Test the series for convergence or divergence

a) $\displaystyle\sum_{n=1}^{\infty} \frac{\sqrt{n^5+n^4-2n+6}}{n^4+3n^3+5n^2}$

b) $\displaystyle\sum_{n=1}^{\infty} \left(\arctan\frac{n}{n+1}\right)^n$

c) $\displaystyle\sum_{n=1}^{\infty} \cos\left(\frac{2n}{n^2+1}\right)$

d) $\displaystyle\sum_{n=1}^{\infty} \sin\left(\frac{1}{n^2+1}\right)$

2.(15 pts) Determine whether the series is absolutely convergent, conditionally convergent, or divergent.

$$\sum_{n=1}^{\infty}(-1)^{n-1}\frac{2n}{4n^2+1}.$$

3.(15 pts) Find the radius of convergence and interval of convergence of the series $\displaystyle\sum_{n=1}^{\infty}\frac{(x+2)^n}{n\,3^n}$.

4.(10 pts) Find a power series representation for the function $f(x) = x\ln(1+2x^2)$.

5.(10 pts) Find the slope of the tangent line to the polar curve $r = \cos\theta$ at the point where $\theta = \frac{\pi}{3}$.

6.(10 pts) Find the area enclosed by one loop of the curve $r = \cos 4\theta$ (eight-leaved rose).

7.(10 pts) Find the length of the curve $r = \sin^2(\theta/2)$, $0 \le \theta \le \pi$.