TA: Ernest Woei *January 20, 2011*

*Last name:*____________________ *First name:*____________________

1 (5 points): Use Ratio or Root test to determine whether the series below converge or diverge. Justify your answer.

$$\sum_{n=4}^{\infty}\left(\frac{n-3}{2n}\right)^n$$

Let $a_n = \left(\frac{n-3}{2n}\right)^n$. $a_n > 0$, since $n-3>0$ and $2n>0$ for $n \geq 4$. We use the Root test to determine if the series converge or diverge.

$$\lim_{n\to\infty}\sqrt[n]{a_n} = \lim_{n\to\infty}\sqrt[n]{\left(\frac{n-3}{2n}\right)^n} = \lim_{n\to\infty}\frac{n-3}{2n} = \frac{1}{2} < 1,$$

thus by the conclusion Root test we have $\sum_{n=4}^{\infty}\left(\frac{n-3}{2n}\right)^n$ convergent.

2 (5 points): Determine whether the series is absolutely convergent, conditonally convergent, or divergent. Justify your answer.

$$\sum_{n=1}^{\infty}(-1)^{n+1}(0.1)^n$$

Recall the Absolute Convergence Test: If $\sum_{n=1}^{\infty}|a_n|$ converges, then $\sum_{n=1}^{\infty}a_n$ converges. Since $\sum_{n=1}^{\infty}|(-1)^{n+1}(0.1)^n| = \sum_{n=1}^{\infty}(0.1)^n$ is a geometric series with $a=0.1$ and $r=0.1$ (since the index starts at $n=1$), then the series is absolutely convergent and thus convergent.