# Sample Test 2

(1) Prove that $a_n = \frac{n^2+4}{3n^2+6}$ converges and determine the limit

2) Determine whether the series

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

(b) $\sum_{n=1}^{\infty} \frac{n!}{((n+1)!)^2}$

(c) $\sum_{n=1}^{\infty} \frac{1}{n^2+\ln n}$

converge or diverge.

(3) Prove that $f(x) = x^4$ is continuous on $[0,10]$.

(4) Find a Taylor series expansion for

(a) $f(x) = \cos(2x)$ about $a = \frac{\pi}{2}$

(b) $f(x) = \tan^{-1} x^2$ about $a = 0$

(5) Prove that $|\tan^{-1}x - \tan^{-1}y| \leq |x-y|$ for $x, y \in [0,1]$