Math 3220 # Homework #4 **Due: Wed., Feb. 27^{th}, 2019**

#1 Comparing Notes Use the comparison test to prove convergence or divergence of the following series.

Note: Use Theorem 2.26 page 127. This is the standard comparison test. Don't use a limit comparison or any other test. *Carefully check that all test hypotheses are fulfilled!*

(a) $\displaystyle\sum_{k=1}^{\infty} \frac{1}{k+2^k}$

(b) $\displaystyle\sum_{k=1}^{\infty} \frac{k}{2k^2-1}$

#2 A Series of Questions State whether the following series either converge absolutely, converge conditionally, or diverge. Use test(s) to prove your assertion. *Carefully check that all test hypotheses are fulfilled!*

(a) $\displaystyle\sum_{k=1}^{\infty} \sin(k)$

(b) $\displaystyle\sum_{k=1}^{\infty} \frac{1+\sin^2(k)}{\sqrt{k}}$

(c) $\displaystyle\sum_{k=1}^{\infty} \frac{(-k)^3}{k!}$

(d) $\displaystyle\sum_{k=1}^{\infty} \frac{(-1)^k}{\sqrt[3]{k}}$

#3 Summing Up Let $\displaystyle\sum_{k=1}^{\infty} a_k$ and $\displaystyle\sum_{k=1}^{\infty} b_k$ be convergent series.

(a) Prove that $\displaystyle\sum_{k=1}^{\infty}(a_k+b_k)$ converges to $\displaystyle\sum_{k=1}^{\infty} a_k + \sum_{k=1}^{\infty} b_k$.

(b) Suppose that $\displaystyle\sum_{k=1}^{\infty} c_k$ diverges. Can we conclude that $\displaystyle\sum_{k=1}^{\infty}(a_k+c_k)$ diverges as well? Prove this or give a counter-example.

RESUBMIT Type up Homework #3 Problem #1 and its solution in LaTeX.