LEBANESE AMERICAN UNIVERSITY
DIVISION OF COMPUTER SCIENCE AND MATHEMATICS
MATH 201 – CALCULUS 3
EXAM 2 – SAMPLE QUESTIONS

1. a. Show that the series $\sum_{n=0}^{\infty} \frac{(-1)^n}{3n^2+5n+1}$ converges absolutely.

b. Show that the series $\sum_{n=2}^{\infty} \frac{(-1)^n}{\ln(n)}$ converges conditionally.

c. Determine convergence or divergence of the series $\sum_{n=0}^{\infty} \frac{n^2}{(2n)!}$.

d. Determine convergence or divergence of the series $\sum_{n=0}^{\infty} \frac{(-1)^n}{2+\cos(n)}$.

2. Find the radius and interval of convergence of the following power series:

a. $\sum_{n=1}^{\infty} \frac{(-3)^n}{n}(x-2)^n$

b. $\sum_{n=0}^{\infty} \frac{(-1)^n}{\sqrt{n+1}}(2x-1)^n$

3. a. Write the Maclaurin series for the function $f(x) = xe^x$ using any method you like, and determine the values of x for which the series converges to $f(x)$.

b. Find the value of the infinite sum $\sum_{n=1}^{\infty} \frac{n+1}{n!}$. (Hint: Use differentiation)

4. a. Find the third Maclaurin polynomial of the function $f(x) = \sin(2x)$

b. Use it to approximate the definite integral $\int_1^2 \frac{\sin(2x)}{x} dx$

5. **a.** Find the Taylor series of the function $f(x) = \ln(x)$ with center $a = 1$.

b. Use part **a** to write $\ln 2$ as an infinite series.

c. Using a polynomial approximation of degree 3 to $\ln(x)$, find an approximate value of $\ln 2$.