MSLC - Math 1172 Exam 2 Review

1. Find the following integrals:

   a) $\int \frac{x+5}{(x-1)(x+2)}\,dx$ b) $\int_0^1 \frac{x^3+x^2+x+1}{x^2+4x+3}\,dx$ c) $\int_1^\infty \frac{1}{x^4+x^2}\,dx$

   d) $\int_{\ln 2}^{\ln 3} \frac{4e^x}{3e^{2x}-2e^x-1}\,dx$ e) $\int_1^\infty \frac{e}{x\ln^2 x}\,dx$ f) $\int x\arcsin(x)\,dx$

2. Considering the following sequences.

   I. Find the limit of the sequence $\{a_n\}$ if it exists.

   II. Determine if the associated series $\left(\sum_{n=1}^{\infty} a_n\right)$ converges or diverges. If the series is geometric and convergent, find the value of the series.

   a) $\left\{\frac{5}{n}\right\}_{n=1}^{\infty}$ b) $\left\{\frac{3^{2n}}{11^{n+5}}\right\}_{n=3}^{\infty}$ c) $\left\{\frac{n-1}{n!}\right\}_{n=1}^{\infty}$ d) $\left\{\frac{n^2-3}{4\ln(n)}\right\}_{n=3}^{\infty}$ e) $\left\{\frac{1}{\sqrt{n}-\sqrt{n+1}}\right\}_{n=2}^{\infty}$

3. Let $f(x)=x^4e^x$

   a. Find the first four terms of the approximating polynomial of $f(x)$ centered at $x=0$.

   b. Use the approximating polynomial from (a) to estimate $16e^2$.

   c. SKIP – not relevant for this exam

   d. Find the MacLaurin series for $f(x)=x^4e^x$

   e. Find the radius of convergence for the MacLaurin series in (e).

   f. Use your answer to part (e) to find the MacLaurin series for $4x^3e^x+x^4e^x$

4. Let $f(x)=x^2+5x+3$

   a. Find the Taylor series for $f(x)$ centered at $x=2$.

   b. Use the Taylor Series from (a) to estimate $f(1)$.

   c. SKIP – not relevant for this exam

5. Consider the power series $\sum_{k=1}^{\infty} \frac{x^{k+4}}{(k+3)2^k}$. Find the radius of convergence and find the function represented by the power series.

6. a. Find the Taylor Series centered at x=0 for f(x)=ln(1-x).

   b. Find the Taylor Series centered at x=0 for g(x)=ln(1+4x^2).

   c. Find $\lim_{x\to 0} \frac{\ln(1+4x^2)-4x^2}{4x^4+5x^6}$

   d. Let $h(x)=x^3\ln(1+4x^2)$. Find $h^{(77)}(0)$.