

Homework 10 03/20: MATH 112 Prof. Maxwell Auerbach

Show all work. No credit will be given for answers without sufficient work. No calculators are allowed. Collaboration with classmates is allowed, but all work submitted must be written out and explained by you.

2 Homework 10 Problems: Power Series Representation

2.1 Find a power series representation for the function and determine the radius of convergence.

2.1 a) (11.9.6) $f(x) = \frac{4}{2x+3}$

2.1 b) (11.9.16) $f(x) = x^2 \arctan(x^3)$

2.1 c) (11.9.15) $f(x) = \ln(5-x)$

2.1 d) (11.9.18) $f(x) = \left(\frac{x}{2-x}\right)^3$

2.1 e) (11.9.8) $f(x) = \frac{x}{2x^2+1}$

2.1 f) (11.9.9) $f(x) = \frac{x-1}{x+2}$

2.1 g) (11.9.28) $f(x) = \int \frac{\arctan(x)}{x} dx$

2.1 h) (11.9.15) $f(x) = \ln(5-x)$

Extra Problems 03/20: MATH 112 Prof. Maxwell Auerbach

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3 Extra Problems: Power Series Representation

3.1 Find a power series representation for the function and determine the radius of convergence.

3.1 a) (11.9.10) $f(x) = \frac{x+a}{x^2a^2}$ $a > 0$

3.1 f) (11.9.7) $f(x) = \frac{x^2}{x^4 + 16}$

3.1 b) (11.9.4) $f(x) = \frac{5}{1-4x^2}$

3.1 g) (11.9.20) $f(x) = \frac{x^2 + x}{(1-x)^3}$

3.1 c) (original) $f(x) = \arctan(4x)(x+1)^2$

3.1 h) (original) $f(x) = \frac{d}{dx}(\arctan(x)x)$

3.1 d) (11.9.17) $f(x) = \frac{x}{(1+4x)^2}$

3.1 i) (11.9.19) $f(x) = \frac{1+x}{(1-x)^2}$

3.1 e) (original) $f(x) = \ln(2-x)x^2$

3.1 j) (original) $f(x) = \ln(x)$

3.2 (11.9.40)

3.2 a) Starting with the geometric series $\sum_{n=0}^{\infty} x^n$, find the sum of the series $\sum_{n=1}^{\infty} nx^{n-1}$ for $|x| < 1$.

3.2 b) Find the sum of each of the following series: $\sum_{n=1}^{\infty} nx^n$ for $|x| < 1$ and $\sum_{n=1}^{\infty} \frac{n}{2^n}$

3.2 c) Find the sum of each of the following series: $\sum_{n=2}^{\infty} n(n-1)x^n$ for $|x| < 1$, $\sum_{n=2}^{\infty} \frac{n^2 - n}{2^n}$, and $\sum_{n=1}^{\infty} \frac{n^2}{2^n}$