

MA 114 Worksheet # 9: Taylor Series

1. Find the terms through degree 3 of the Maclaurin series of $f(x)$.

(a) $f(x) = (1 + x)^{1/4}$.

(b) $f(x) = e^{\sin(x)}$.

2. Find the Taylor series centered at c and find the interval on which the expansion converges to f .

(a) $f(x) = \frac{1}{x}$ at $c = 1$.

(b) $f(x) = e^{3x}$ at $c = -1$.

(c) $f(x) = x^3 + 3x - 1$ at $c = 0$.

(d) $f(x) = x^3 + 3x - 1$ at $c = 2$.

3. Find a power series representation for

(a) $f(x) = x \cos(x^2)$.

(b) $g(x) = (1 + x)e^{-x}$.

4. Show that $\lim_{x \rightarrow 0} \frac{e^x - \cos(x)}{\sin(x)} = 1$ using power series. Verify your answer with l'Hospital's Rule.

[HINT: Write out the power series for each term and factor out the lowest power of x from the numerator and the denominator, and then consider the limit.]