
Math 2150 - Homework # 11

Review of Power Series

1. Find a power series expansion for $f(x)$ centered at x_0 .

State the radius of convergence r of the series.

(a) $f(x) = x^3 + x$ centered at $x_0 = 1$

(b) $f(x) = x$ centered at $x_0 = -2$

(c) $f(x) = x^2$ centered at $x_0 = 1$

(d) $f(x) = \frac{1}{x}$ centered at $x_0 = 1$.

[Hint: Use $\ln(x) = (x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \frac{1}{4}(x-1)^4 + \dots$
which has radius of convergence $r = 1$]

(e) $f(x) = e^{x^2}$ centered at $x_0 = 0$

[Hint: Use the power series for e^x .]

(f) $f(x) = \frac{-x}{1-x^2}$ centered at $x_0 = 0$

[Hint: Use $\frac{1}{1-x} = 1 + x + x^2 + x^3 + x^4 + x^5 + \dots$
which has radius of convergence $r = 1$]

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2. (a) Estimate $\sin(0.1)$ using the first five terms of the power series for $\sin(x)$ centered at $x_0 = 0$.

- (b) Then use your calculator to compare your estimate to the true value of $\sin(0.1)$. How close were you?

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3. (a) Estimate $\ln(1.1)$ using the first four terms of the power series for $\ln(x)$ centered at $x_0 = 1$.

- (b) Then use your calculator to compare your estimate to the true value of $\ln(1.1)$. How close were you?
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