Name: _____   / 25

30 minutes maximum. No aids (book, calculator, etc.) are permitted. Show all work and use proper notation for full credit. Answers should be in reasonably-simplified form. 25 points possible.

1. **[8 points]** Using any convenient method, find the Maclaurin series of the given function.

   a. $f(x) = 7^x$

   b. $f(x) = \cos(\sqrt{x})$

2. [4 points] Using the answer from **1 b**, express the integral as an infinite series.

$$\int \cos(\sqrt{x})\,dx =$$

3. [6 points] Let $f(x) = \sqrt[3]{x}$.

    a. Find the first and second Taylor polynomials, of degrees 1 and 2, of $f(x)$ at $x = 2$.

    b. Use the first Taylor polynomial to estimate $\sqrt[3]{3}$.

4. **[7 points]** Use the ratio or root test, plus a check on series convergence at the endpoints, to find the interval of convergence of the Maclaurin series for $f(x) = \ln(1+x)$.

EC. [1 points] (**Extra Credit**) Find the value of the 24th derivative of $f(x) = e^{x^2}$ at $x = 0$. (*Hint. Taylor series? It relates to derivatives at $x = 0$.*)

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