

## Math 102 — More Taylor series

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**Problem 1.** Find the Maclaurin series of each function  $f$  given below using the given method. Write out the first five non-zero terms and then give the series in summation notation.

- a.  $f(x) = \frac{1}{1+x^2}$  using substitution into a known Maclaurin series
- b.  $f(x) = \arctan x$  using term-by-term integration of a known Maclaurin series
- c.  $f(x) = \frac{1}{(1-x)^2}$  using term-by-term differentiation of a known Maclaurin series

**Problem 2.** Approximate the following integrals using the first three non-zero terms of a Maclaurin series.

- a.  $\int_0^1 \sin(x^2) dx$
- b.  $\int_0^1 x^2 e^{-x^2} dx$

**Problem 3.** Use Maclaurin series to compute the following limits.

- a.  $\lim_{x \rightarrow 0} \frac{\sin x - x + \frac{1}{6}x^3}{x^5}$
- b.  $\lim_{x \rightarrow 0} \frac{x - \ln(1+x)}{x^2}$