Name: _____

- This packet is due at **12:00 pm PDT (noon) on Friday, May 21**.
- Neatly fill out this packet either directly or on your own paper. Then upload your answers to Canvas. Please clearly number each problem and keep them in order.
- For each problem in this packet, **organize and show all of your work and justification** for your answer.
- Make sure that it is clear what your final answer is. This may mean boxing/circling it or it may mean doing neither.
- If you are required to draw a graph of a function, each axis must be labeled and given a scale.
- I will not be grading every individual problem, but answers will be available on Canvas after the due date.
- I am happy to help you however I can. Here are some options:
  - Come to my office hours (see syllabus).
  - Email me directly at gknapp4@uoregon.edu

1. Find the power series for each function with the given center a, and identify its interval of convergence.

   (a) $f(x) = \dfrac{x}{1+x^2}$, $a = 0$

(b) $f(x) = \dfrac{x^2 - 6x + 9}{7 + x}$, $a = 3$

2. Use partial fractions to find the power series of each function centered at 0. Find an interval of x-values on which the power series converges. (Finding the exact interval of convergence here requires more advanced tools than we currently have.)

   (a) $\dfrac{4}{(x-3)(x+1)}$

(b) $\dfrac{5}{(x^2+4)(x^2-1)}$

3. Recall that $\dfrac{1}{1-x} = \displaystyle\sum_{n=0}^{\infty} x^n$ for $x \in (-1, 1)$. Use term-by-term differentiation or integration to find power series for each function centered at the given point. Be sure to include the interval of convergence.

   (a) $\ln(1 - x^2)$ at $a = 0$

(b) $\arctan(x^2)$ at $a = 0$

4. Express $\sum_{n=0}^{\infty} \frac{1}{x^n}$ as a ratio of two polynomials.

5. Let $f(x) = 2\sum_{n=0}^{\infty} x^n$ and $g(x) = \sum_{n=0}^{\infty} nx^n$. Find the power series and interval of convergence of $f(x)g(x)$.

   Hint: recall the formula $\sum_{j=1}^{n} j = \frac{n(n+1)}{2}$