Instructions
Read today's Notes and Learning Goals

1. Question Details
What is the following binomial coefficient?
\[
\binom{7}{3} = \hfill \\
\]

2. Question Details
What is the following binomial coefficient?
\[
\binom{7/3}{3} = \hfill \\
\]

3. Question Details
What is the following binomial coefficient?
\[
\binom{-3}{7} = \hfill \\
\]

4. Question Details
What is the following sequence of binomial coefficients?
- \[
\binom{2/3}{0} = \hfill \\
\]
- \[
\binom{2/3}{1} = \hfill \\
\]
- \[
\binom{2/3}{2} = \hfill \\
\]
- \[
\binom{2/3}{3} = \hfill \\
\]

Use the above to approximate the following binomial series up to the 3rd order term.
\[
(1 + x)^{2/3} = \hfill \\
\]
5. Question Details

What is the following sequence of binomial coefficients?

- \( \binom{-4}{0} = \) 
- \( \binom{-4}{1} = \) 
- \( \binom{-4}{2} = \) 
- \( \binom{-4}{3} = \)

Use the above to approximate the following binomial series up to the 3rd order term.

\[(1 + x)^{-4} \approx \] 

6. Question Details

Compute the first four coefficients of the binomial series for \((1 + x)^{-1}\).

- \( \binom{-1}{0} = \) 
- \( \binom{-1}{1} = \) 
- \( \binom{-1}{2} = \) 
- \( \binom{-1}{3} = \)

From the pattern, guess the following:

- \( \binom{-1}{6} = \) 
- \( \binom{-1}{15} = \)

Write the 6th degree Taylor polynomial for

\[(1 + x)^{-1} = \] 

7. Question Details

Approximate the following binomial series up to the third order term

\[\left(1 + \frac{x}{3}\right)^{3/2} = \]
8. Question Details

a. Use the binomial series to find the 3rd degree Taylor Polynomial approximation for:

\[(1 + x)^{1/2} = \]

b. Use the 3rd degree Taylor Polynomial approximation above to find the 6th degree Taylor Polynomial approximation for:

\[\sqrt{1 + 4x^2} = \]

9. Question Details

Write the binomial series out to order six for:

\[(1 - x^2)^{3/2} \]

Then multiply by \(x^2\) to get the 8th order Taylor polynomial for:

\[x^2(1 - x^2)^{3/2} = \]

10. Question Details

a. Use the binomial series to find the 3rd degree Taylor Polynomial approximation for:

\[(1 + x)^{-1/2} = \]

b. Use the 3rd degree Taylor Polynomial approximation above to find the 4th degree Taylor Polynomial approximation for:

\[\frac{2x}{\sqrt{1 + x}} = 2x(1 + x)^{-1/2} = \]

11. Question Details

Refer to today's Notes and Learning Goals, Section 5. Follow the steps of that example to compute the quadratic approximation of:

\[\sqrt{16 + x} = \]

12. Question Details

Find the quadratic approximation of:

\[(27 + 6x)^{1/3} = \]
13. Question Details

Find the fourth degree approximation of

\[ x^2 \sqrt{9 + x} = \]

14. Question Details

Compute the following. Simplify your answers as far as possible.

\[ \binom{10}{4} = \]
\[ \binom{10}{3} = \]
\[ \binom{-3/2}{4} = \]
\[ \binom{-3/2}{3} = \]
\[ \binom{k}{4} = \]
\[ \binom{k}{3} = \]

15. Question Details

Compute the following. Simplify your answers as far as possible.

\[ \frac{3!}{4!} = \]
\[ \frac{25!}{24!} = \]
\[ \frac{n!}{(n+1)!} = \]

16. Question Details

Compute the following. Simplify your answers as far as possible.

\[ \frac{15 \cdot 14 \cdot 13 \cdots (15-n)}{15 \cdot 14 \cdot 13 \cdots (15-n+1)} = \]
\[ \binom{15}{n+1} = \]
\[ \binom{15}{n} = \]
\[ \binom{1/2}{n+1} = \]
\[ \binom{1/2}{n} = \]
\[ \binom{k}{n+1} = \]
\[ \binom{k}{n} = \]