MathQuest: Series

Power Series

1. Consider the power series $\sum_{n=1}^{\infty} \frac{(x-4)^n}{4^n}$. What values of x will make this series converge?

   (a) This series converges for all values of x.
   (b) This series converges for all values of x between 0 and 8.
   (c) This series converges for all values of x between -4 and 4.
   (d) This series converges for all values of x between -8 and 0.
   (e) This series diverges for all values of x.

2. Consider the power series $\sum_{n=1}^{\infty} \frac{(x-4)^n}{4^n}$. Will this series converge if $x = 0$ or if $x = 8$?

   (a) This series converges for both $x = 0$ and $x = 8$.
   (b) This series does not converge for either $x = 0$ or $x = 8$.
   (c) This series converges for $x = 8$ but does not converge for $x = 0$.
   (d) This series converges for $x = 0$ but does not converge for $x = 8$.

3. Consider the power series $\sum_{n=1}^{\infty} \frac{(3x)^n}{n^8}$. What values of x will make this series converge?

   (a) This series converges for all values of x.
   (b) This series converges for all values of x between -3 and 3.
   (c) This series converges for all values of x between 0 and 3.
   (d) This series converges for all values of x between -1/3 and 1/3.
   (e) This series diverges for all values of x.

4. Consider the power series $\sum_{n=1}^{\infty} \frac{(2x)^n}{n^7}$. Will this series converge if $x = -1/2$ or if $x = +1/2$?

   (a) This series converges for both $x = -1/2$ and $x = +1/2$.
   (b) This series does not converge for either $x = -1/2$ or $x = +1/2$.
   (c) This series converges for $x = -1/2$ but does not converge for $x = +1/2$.
   (d) This series converges for $x = +1/2$ but does not converge for $x = -1/2$.

5. Consider the power series $\sum_{n=1}^{\infty} \frac{(x-8)^n}{n(-6)^n}$. What values of x will make this series converge?

   (a) This series converges for all values of x.
   (b) This series converges for all values of x between 2 and 14.
   (c) This series converges for all values of x between -8 and 8.
   (d) This series converges for all values of x between 0 and 16.
   (e) This series diverges for all values of x.

6. Consider the power series $\sum_{n=1}^{\infty} \frac{(x-5)^n}{n(-3)^n}$. Will this series converge if $x = 2$ or if $x = 8$?

   (a) This series converges for both $x = 2$ and $x = 8$.
   (b) This series does not converge for either $x = 2$ or $x = 8$.
   (c) This series converges for $x = 2$ but does not converge for $x = 8$.
   (d) This series converges for $x = 8$ but does not converge for $x = 2$.

7. A power series converges when $x = 2.5, 2.7$ and 2.8, but diverges when $x = 2.1, 2.2$ and 2.9. Which of the following could be the point where the power series is centered?

   (a) 2.3
   (b) 2.6
   (c) 2.7
   (d) 2.8
   (e) All of the above are possible.
   (f) More than one but not all of the above are possible.