Exercises 1–4. Find the sum of the series.

1. $\displaystyle\sum_{k=0}^{\infty} \left(\frac{3}{4}\right)^k.$

2. $\displaystyle\sum_{k=0}^{\infty} (-1)^k \left(\frac{1}{2}\right)^k.$

3. $\displaystyle\sum_{k=0}^{\infty} \frac{(\ln 2)^k}{k!}.$

4. $\displaystyle\sum_{k=1}^{\infty} \frac{1}{k(k+1)}.$

Exercises 5–20. Determine convergence or divergence if the series has only nonnegative terms; determine whether the series is absolutely convergent, conditionally convergent, or divergent if it contains both positive and negative terms.

5. $\displaystyle\sum_{k=0}^{\infty} \frac{1}{2k+1}.$

6. $\displaystyle\sum_{k=0}^{\infty} \frac{1}{(2k+1)(2k+3)}.$

7. $\displaystyle\sum_{k=0}^{\infty} \frac{(-1)^k}{(k+1)(k+2)}.$

8. $\displaystyle\sum_{k=0}^{\infty} \frac{(-1)^k}{(2k+1)}.$

9. $\displaystyle\sum_{k=0}^{\infty} \frac{(-1)^k(100)^k}{k!}.$

10. $\displaystyle\sum_{k=0}^{\infty} \frac{k+1}{3^k}.$

11. $\displaystyle\sum_{k=1}^{\infty} \frac{k!}{k^{k/2}}.$

12. $\displaystyle\sum_{k=0}^{\infty} \frac{k+\cos k}{k^3+1}.$

13. $\displaystyle\sum_{k=0}^{\infty} \frac{(-1)^k}{\sqrt{(k+1)(k+2)}}.$

14. $\displaystyle\sum_{k=1}^{\infty} k\left(\frac{3}{4}\right)^k.$

15. $\displaystyle\sum_{k=0}^{\infty} \frac{k^e}{e^k}.$

16. $\displaystyle\sum_{k=1}^{\infty} (-1)^{k-1}\frac{\ln k}{\sqrt{k}}.$

17. $\displaystyle\sum_{k=0}^{\infty} \frac{(2k)!}{2^k k!}.$

18. $\displaystyle\sum_{k=0}^{\infty} \frac{(-1)^k}{\sqrt{k^3+1}}.$

19. $\displaystyle\sum_{k=0}^{\infty} \frac{(\arctan k)^2}{1+k^2}.$

20. $\displaystyle\sum_{k=0}^{\infty} \frac{2^k+k^4}{3^k}.$