Use a convergence test of your choice to determine whether the following series converge or diverge. If the series converges, does it do so conditionally or absolutely. Justify your answers.

23. $\sum_{k=1}^{\infty} k^{-2/3}$

24. $\sum_{k=1}^{\infty} \frac{2k^2 + 1}{\sqrt{k^3 + 2}}$

26. $\sum_{k=1}^{\infty} \left(\frac{k}{k+3}\right)^{2k}$

27. $\sum_{k=1}^{\infty} \frac{2^k k!}{k^k}$

28. $\sum_{k=1}^{\infty} \frac{1}{\sqrt{k}\sqrt{k+1}}$

34. $\sum_{k=4}^{\infty} \frac{2}{k^2 - 10}$

37. $\sum_{k=0}^{\infty} \frac{2 \cdot 4^k}{(2k+1)!}$

45. $\sum_{k=1}^{\infty} (-1)^k k e^{-k}$

47. $\sum_{k=1}^{\infty} \frac{(-1)^{k+1} 10^k}{k!}$

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

50. $\sum_{k=0}^{\infty} \frac{(-1)^k}{e^k + e^{-k}}$

33. $\sum_{k=1}^{\infty} k^5 e^{-k}$

36. $\sum_{k=1}^{\infty} k e^{-k}$

38. $\sum_{k=0}^{\infty} \frac{9^k}{(2k)!}$

48. $\sum_{k=2}^{\infty} \frac{(-1)^k}{k \ln k}$

44. $\sum_{k=1}^{\infty} \frac{(-1)^{k+1}(k^2 + 4)}{2k^2 + 1}$

30. $\sum_{k=1}^{\infty} k \sin \frac{1}{k}$

29. $\sum_{k=1}^{\infty} \frac{3}{2 + e^k}$

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

31. $\sum_{k=1}^{\infty} \frac{\sqrt[4]{k}}{k^3}$

Use a convergence test of your choice to determine whether the following series converge or diverge.

23. $\sum_{k=1}^{\infty} k^{-2/3}$ p-series,

24. $\sum_{k=1}^{\infty} \frac{2k^2+1}{\sqrt{k^3+2}}$ LCT w/ $\sum \frac{k^2}{\sqrt{k^3}}$

26. $\sum_{k=1}^{\infty} \left(\frac{k}{k+3}\right)^{2k}$ ~~Root test.~~ Test for Div,

27. $\sum_{k=1}^{\infty} \frac{2^k k!}{k^k}$ ratio test

28. $\sum_{k=1}^{\infty} \frac{1}{\sqrt{k}\sqrt{k+1}}$ LCT w/ $\sum \frac{1}{k}$

34. $\sum_{k=4}^{\infty} \frac{2}{k^2-10}$ LCT w/ $\sum \frac{1}{k^2}$

49. $\sum_{k=1}^{\infty} \frac{(-2)^{k+1}}{k^2} = \sum \frac{(-1)^{k+1} 2^{k+1}}{k^2}$

ratio test or Test for Div.

45. $\sum_{k=1}^{\infty} (-1)^k k e^{-k}$ AST

How about $\sum \frac{k}{e^k}$

Ratio test

37. $\sum_{k=0}^{\infty} \frac{2 \cdot 4^k}{(2k+1)!}$ ratio test.

50. $\sum_{k=0}^{\infty} \frac{(-1)^k}{e^k + e^{-k}}$ show Abs convergence by comparison to $\sum \frac{1}{e^k}$ which converges by either the ratio/root or geometric series test.

33. $\sum_{k=1}^{\infty} k^5 e^{-k}$ use the ratio test.

36. $\sum_{k=1}^{\infty} k e^{-k}$ use the ratio test.

38. $\sum_{k=0}^{\infty} \frac{9^k}{(2k)!}$ use the ratio test.

48. $\sum_{k=2}^{\infty} \frac{(-1)^k}{k \ln k}$ A. S. T.

show conditional convergence w/ the integral test

44. $\sum_{k=1}^{\infty} \frac{(-1)^{k+1}(k^2+4)}{2k^2+1}$ Test for Divergence.

30. $\sum_{k=1}^{\infty} k \sin \frac{1}{k}$ Test for Divergence.

29. $\sum_{k=1}^{\infty} \frac{3}{2 + e^k}$ L.C.T w/ $\sum \frac{1}{e^k}$. See note on # 50

46. $\sum_{k=1}^{\infty} \frac{(-1)^k}{\sqrt{k^2+1}}$ A. S. T.

show conditional convergence w/ L.C.T on $\sum \frac{1}{k}$

31. $\sum_{k=1}^{\infty} \frac{\sqrt[3]{k}}{k^3} = \sum_{k=1}^{\infty} \frac{1}{k^{\frac{8}{3} - \frac{1}{k}}}$

comparison test w/ $\sum \frac{1}{k^2}$

Distribution of Tests used (some exercises allow for multiple approaches).

ratio test 𝍸 ||||

root test |

LCT 𝍸

Test for Divergence ||||

AST ||

comparison test ||

Integral test |

p-series |

Geometric series |

The Best Tests

Ratio test

L.C.T.

Test for Divergence

w/runners up of the comparison test & AST.