AP Calculus
Section 9.5 – The Comparison, Ratio, and Root Tests

1. Make a guess about the convergence or divergence of the series, and confirm your guess using the comparison test.

a. $\sum_{k=1}^{\infty} \frac{1}{5k^2 - k}$

b. $\sum_{k=1}^{\infty} \frac{3}{k - \frac{1}{4}}$

3. In each part, use the comparison test to show that the series converges.

a. $\sum_{k=1}^{\infty} \frac{1}{3^k + 5}$

b. $\sum_{k=1}^{\infty} \frac{5\sin^2 k}{k!}$

Use the limit comparison test to determine whether the series converges.

5. $\sum_{k=1}^{\infty} \frac{4k^2 - 2k + 6}{8k^7 + k - 8}$

7. $\sum_{k=1}^{\infty} \frac{5}{3^k + 1}$

9. $\sum_{k=1}^{\infty} \frac{1}{\sqrt[3]{8k^2 - 3k}}$

Use the ratio test to determine whether the series converges. If the test is inconclusive, then say so.

11. $\sum_{k=1}^{\infty} \frac{3^k}{k!}$

13. $\sum_{k=1}^{\infty} \frac{1}{5k}$

15. $\sum_{k=1}^{\infty} \frac{k!}{k^3}$

Use the root test to determine whether the series converges. If the test is inconclusive, then say so.

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

19. $\sum_{k=1}^{\infty} \frac{k}{5^k}$

Use any method to determine whether the series converges.

25. $\sum_{k=0}^{\infty} \frac{7^k}{k!}$ (Ratio Test)

27. $\sum_{k=1}^{\infty} \frac{k^2}{5^k}$ (Ratio Test)

29. $\sum_{k=1}^{\infty} k^{50} e^{-k}$ (Ratio Test)

31. $\sum_{k=1}^{\infty} \frac{\sqrt{k}}{k^3 + 1}$ (Limit Comp.)

33. $\sum_{k=1}^{\infty} \frac{1}{\sqrt{k(k+1)}}$ (Limit Comparison)

35. $\sum_{k=1}^{\infty} \frac{2 + \sqrt{k}}{(k+1)^3 - 1}$ (Limit Comp.)

37. $\sum_{k=1}^{\infty} \frac{1}{1 + \sqrt{k}}$ (Limit Comp.)

39. $\sum_{k=1}^{\infty} \frac{\ln k}{e^k}$ (Ratio Test)

41. $\sum_{k=1}^{\infty} \frac{(k+4)!}{4!k!4^k}$ (Ratio Test)