

9-#6: p. 636: 13, 15, 23, 27, 30, 47, 53, 55, 59, 60, 66, 71, 79-85

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

converges
dec, $\rightarrow 0$
alt series test

15. diverges
nth term
 $\lim_{n \rightarrow \infty} \frac{(-1)^n n^2}{n^2+1} \neq 0$

23. $\sum_{n=1}^{\infty} \cos(n\pi)$

= -1 + 1 - 1
diverges nth term
 $\lim_{n \rightarrow \infty} \cos(n\pi) \neq 0$

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

$\frac{1}{3} - \frac{\sqrt{2}}{4} + \frac{\sqrt{3}}{5} - \frac{\sqrt{4}}{6} + \frac{\sqrt{5}}{7}$
- .3 .354 .346 - .3 + .32 - ...
dec for $n > 2$
 $\lim_{n \rightarrow \infty} \frac{\sqrt{n}}{n+2} = \lim_{n \rightarrow \infty} \frac{1}{2\sqrt{n}} = 0$

converges by alternating series test.

30. $\sum_{n=1}^{\infty} \left[(-1)^{n+1} \frac{2n-1}{3n-2} \right]$

diverges - nth term test
 $\lim_{n \rightarrow \infty} \frac{2n-1}{3n-2} = \frac{2}{3}$

47. converges absolutely
since $\sum \frac{1}{(n+1)^2}$ converges
by comparison to $\sum \frac{1}{n^2}$
p-series $p=2$

53. $\sum_{n=2}^{\infty} \frac{(-1)^n}{\ln(n)}$ Conditionally convergent

$\left[\frac{1}{\ln(n)} > \frac{1}{n} \text{ for } n > 2 \text{ and } \frac{1}{n} \text{ div.} \right]$
so not abs. conv.

$\left[\sum \frac{(-1)^n}{\ln(n)} \text{ converges by alt. series test since } \frac{1}{\ln(n)} \text{ is dec and } \rightarrow 0 \right]$

55. $\sum_{n=2}^{\infty} \frac{(-1)^n n}{n^3-1}$ converges absolutely

$\sum_{n=2}^{\infty} \frac{n}{n^3-1}$ converges
by limit comparison
 $\lim_{n \rightarrow \infty} \frac{n}{n^3-1} \cdot \frac{n^2}{1} = 1$ pos and finite

59. $\sum_{n=0}^{\infty} \frac{\cos(n\pi)}{n+1} = \sum_{n=0}^{\infty} \frac{(-1)^n}{n+1}$

Conditionally convergent
since $\sum_{n=0}^{\infty} \frac{1}{n+1}$ diverges

60. $\sum_{n=1}^{\infty} (-1)^{n+1} \arctan(n)$

diverges, nth term
 $\lim_{n \rightarrow \infty} \arctan(n) = \frac{\pi}{2} \neq 0$

66. b) alternating

71. If $p > 0$ then series is dec and $\rightarrow 0$
so conv by alt series test.

79. converges
p-series $p=3/2$

80. converges
same magnitude
as $\sum 1/n^2$

81. diverges
 3^n is "stronger"
than n^2
could be nth
term test
$$\lim_{n \rightarrow \infty} \frac{3^n}{n^2} = \lim_{n \rightarrow \infty} \frac{3^n \cdot \ln 3}{2n}$$
$$= \lim_{n \rightarrow \infty} \frac{3^n \cdot \ln 3 \cdot \ln 3}{2} = \infty$$

82. converges
compare to
convergent geo $\sum (1/2)^n$

83. converges geo $|r|=7/8 < 1$

84. diverges nm term test

$$\lim_{n \rightarrow \infty} \frac{3n^2}{2n^2+1} = 3/2$$

$$85. \sum_{n=1}^{\infty} 100 \left[(e)^{-1/2} \right]^n$$

$$\sum_{n=1}^{\infty} 100 \left[\frac{1}{\sqrt{e}} \right]^n$$

converges geo

$$|r| = 1/\sqrt{e} < 1$$