

MATH 230  
11.3

Directions: Show all work on a separate sheet of paper for full credit.

1. Use the Integral Test to determine whether the series is convergent or divergent.

- (a)  $\sum_{n=1}^{\infty} n^{-0.3}$  Diverges to  $\infty$
- (b)  $\sum_{n=1}^{\infty} n^2 e^{-n^3}$  Converges (Integral converges to  $\frac{1}{3}e^{-1}$ )

2. Determine whether the series is convergent or divergent.

- (a)  $\sum_{n=1}^{\infty} \frac{1}{n\sqrt{2}}$   $\int_1^{\infty} \frac{1}{x\sqrt{2}} dx$  converges. Or Converges by  $p$ -test
- (b)  $\sum_{n=1}^{\infty} n^{-0.9999}$   $\int_1^{\infty} \frac{1}{n^{0.9999}} dx$  diverges. Or Diverges by  $p$ -test
- (c)  $\frac{1}{5} + \frac{1}{7} + \frac{1}{9} + \frac{1}{11} + \frac{1}{13} + \dots$  Hint: Write as  $\sum_{n=1} \frac{1}{2n+3}$  Diverges to  $\infty$  (IT)
- (d)  $1 + \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} + \frac{1}{4\sqrt{4}} + \frac{1}{5\sqrt{5}} + \dots$  Hint: Write as  $\sum_{n=1} \frac{1}{n^{3/2}}$ . Converges (IT)
- (e)  $\sum_{n=1}^{\infty} \frac{\sqrt{n} + 4}{n^2}$  Converges (break into 2 integrals. Integrate separately.)
- (f)  $\sum_{n=1}^{\infty} \frac{1}{n \ln(n)}$   $\int \frac{1}{x \ln x} dx$ . Let  $u = \ln x$ . Diverges to  $\infty$  (IT)
- (g)  $\sum_{n=1}^{\infty} \frac{\ln(n)}{n^2}$  Converges (IT using By Parts).  $u = \ln x$ ,  $dv = \frac{1}{x^2} dx$
- (h)  $\sum_{n=1}^{\infty} \frac{1}{n^2 + 4}$  Converges (Trig Sub or Use the formula  $\int \frac{1}{x^2 + a^2} dx = \frac{1}{a} \tan^{-1}(x/a)$ )

3. Estimate  $\sum_{n=1}^{\infty} \frac{1}{(2n+1)^6}$  correct to 5 decimal places.  $n = 4$  with  $S_4 \approx 0.00145$