Problem Set
Sections 11.1

Sequences

Problem 1

Determine whether the sequence converges or diverges. If it converges, find the limit.

$$a_n = 3^n 7^{-n}, \qquad b_n = 3^{-n} 7^n$$

Problem 2

Determine whether the sequence converges or diverges. If it converges, find the limit.

$$a_n = \tan\left(\frac{3n\pi}{5+12n}\right), \qquad b_n = \arctan(3n)$$

Problem 3

Determine whether the sequence converges or diverges. If it converges, find the limit.

$$\left\{\frac{(-1)^n n}{n^2+2}\right\}, \qquad \left\{\frac{(-1)^n n^2}{n^2+2}\right\}$$

Problem 4

Determine whether the sequence converges or diverges. If it converges, find the limit.

$$\left\{\left(1+\frac{2}{n}\right)^{n}\right\}_{n=1}^{\infty}$$

Problem 5

Determine whether the sequence converges or diverges. If it converges, find the limit.

$$\left\{2+\frac{\sin n}{n}\right\}_{n=1}^{\infty}$$

Problem 6

Determine whether the sequence converges or diverges. If it converges, find the limit.

$$a_n = \frac{n!}{2^n}$$

Problem 7

Find the limit of the sequence $\{\sqrt{2}, \sqrt{2\sqrt{2}}, \sqrt{2\sqrt{2\sqrt{2}}}, \dots\}$

Problem 8

The sequence

$$a_1 = 1, \quad a_{n+1} = 3 - \frac{1}{a_n}$$

is increasing and $a_n < 3$ for all n. Why is the sequence convergent? Find the limit.