

## Math 199 Mock Exam - 16 Sept, 2014

1. Determine the range of the function  $g(x)$ , and determine the domain of the function  $h(x)$ . Write your answers in interval notation.

$$f(x) = \frac{x+2}{x^2-100}$$

$$g(x) = \sqrt{x-4}$$

$$h = f \circ g$$

2. For each of the sequences below, write out  $a_{10}$ ,  $a_{20}$ , and  $a_{1000}$ . Then, choose one of them and prove it is strictly increasing, and choose another and prove it is bounded from above. Give the limit of the remaining sequence.

(a)  $a_n = \frac{(-1)^n}{\sqrt{n}}$

(b)  $a_n = 15 - \frac{1}{n^2}$

(c)  $a_n = \left(\frac{7}{10}\right)^n$

3. True or False: If the terms of a sequence are alternately positive and negative numbers, the sequence cannot possibly be convergent.

4. For each of the items at the left, select the item on the right that fits the best. Some items on the right may be used more than once, or not at all.

(a)  $a_n = (-1/2)^n$

(I)  $\lim_{n \rightarrow \infty} a_n = \infty$

(b)  $a_n = (-2)^n$

(II)  $\lim_{n \rightarrow \infty} a_n = -\infty$

(c)  $(a_n) = (0.9, 0.99, 0.9, 0.99, 0.9, 0.99, \dots)$

(III)  $\lim_{n \rightarrow \infty} a_n = 0$

(d)  $a_n = \frac{n+1}{1000}$

(IV)  $\lim_{n \rightarrow \infty} a_n = 1$

(e)  $a_n = \frac{n+1}{n^2}$

(V)  $a_n$  is divergent

(f)  $a_n = \frac{5n+1}{n}$

(VI)  $a_n$  is convergent

5. Consider the sequence generated by  $a_n := \frac{2n-2}{n+1}$ .

- (a) Use the Limit Laws to determine the limit of the sequence.

- (b) Determine the value of  $n$  for which all subsequent terms of the sequence will be within  $\frac{1}{1000}$  of the limit.

6. Consider a geometric sequence with  $a_3 = 48$  and  $a_7 = 3$ . Find the formula for  $a_n$  and the limit.

7. Consider the finite arithmetic sequence

$$-26, -23, \dots, 34.$$

Find the formula for  $a_n$  and the number of terms.