Exam 3

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Question 1

(a) 6, 5.5, 5.25, 5.125

(b) as n approaches infinity, $(\frac{1}{2})^n$ approaches 0. Therefore, a_n approaches 5 + 0 = 5. So the sequence converges to 5.

Question 2

(a) $b_n = 2n$

(b) $b_n = 3(-1)^{n+1}$

(c) $b_n = \frac{n}{2n+1}$

Question 3

(a) 5, 6, 7, 8, 9, 10. Sum: 45

(b) 9, 16, 25. Product: 3600

Question 4

(a) One-To-One: No, $f(1)$ and $f(7)$ are both 8. Onto: No, 2 is not mapped to any element in X

(b) One-To-One: Yes, each element is mapped to a unique element. Onto: Yes, every element is mapped to another element

Question 5

(a) No, F is not One-To-One, c and d of X both map to e of Y

(b) No, G is not One-To-One, a,b, and d of X all map to f of Y

(c) As they stand we can not make F or G One-To-One with out expanding Y, because X has 4 elements and Y only has 3

Question 6

(a)

(i) Yes, h is One-to-One.

Proof: $h(x_1) = h(x_2)$; $2x_1 + 1 = 2x_2 + 1$; $2x_1 = 2x_2$; $x_1 = x_2$

(ii) Yes, h is Onto.

Proof: for any $y \in Z$, we can find an $x \in Z$ such that $h(x) = y$

$y = 2x + 1$; $x = \frac{y-1}{2}$

(b)

(i) No, g is not One-To-One.

Counter: $g(1) = 1^2 - 1 = 0$; $g(-1) = (-1)^2 - 1 = 0$

(ii) No, g is not Onto.

Counter: Ther is no $x \in R$ such that $g(x) = -2$

$x^2 - 1 = -2$; $x^2 = -1$