
The deadline for all homework assignments is the one specified in Archie before 11:59 pm. As discussed in class, It must be correctly uploaded in order to be graded. Show all your work and justifications.

1. ASSIGNMENT 1

Problem 1.1. For each of the following functions limit statements write and prove the limit statement by the rigorous $\epsilon - \delta$ definition of limits:

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- (1) $\lim_{x \rightarrow 0} x^7 + 3 = 3.$
 - (2) $\lim_{x \rightarrow 0} 3x^{11} - 2 = -2.$
 - (3) $\lim_{x \rightarrow 0} 2x^2 - 8 = -8.$
 - (4) $\lim_{x \rightarrow 0} (-8x^3 + 81) = 81.$

Problem 1.1. For each of the following functions limit statements write and prove the limit statement by the rigorous $\epsilon - \delta$ definition of limits: Use the triangle inequality, if needed. Notice that the triangle inequality holds for any number of terms, i.e., $|A_1 + A_2 + A_3 + \dots + A_n| \leq |A_1| + |A_2| + |A_3| + \dots + |A_n|$. For instance for four terms, $|a + b + c + d| \leq |a| + |b| + |c| + |d|$.

- (1) $\lim_{x \rightarrow 0} x^7 + 3x^4 + 3 = 3.$
- (2) $\lim_{x \rightarrow 0} 3x^{11} - 2x^{12} + 2 = 2.$
- (3) $\lim_{x \rightarrow 0} x - 5x^{10} + 4x^3 = 0.$
- (4) $\lim_{x \rightarrow 0} x^5 - 6x^3 - x^2 + 2 = 2.$

Problem 2.1. For each of the following functions limit statements write and prove the limit statement by the rigorous $\epsilon - \delta$ definition of limits:

- (1) $\lim_{x \rightarrow +\infty} \frac{1}{x^3} + \frac{1}{x^4} + 1 = 1.$
- (2) $\lim_{x \rightarrow +\infty} \frac{1}{x^5} + \frac{2}{7x^4} - \frac{20}{x^3} + 1 = 1.$
- (3) $\lim_{x \rightarrow +\infty} \frac{1}{3x^4 + 2} = 0.$