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CS1310

1. Prove that for all integers m and n, if m and n are odd, the mn is odd
   1. Assuming m and n are odd integers, we shall prove that mn is odd.
   2. Since m is odd, m = 2k + 1
   3. Since n is odd, n = 2j + 1
   4. Mn = (2k + 1) \* (2j + 1) = 4kj + 2k + 2 j + 1 = 2(2kj +k +j) + 1
   5. 2(2kj +k+j) + 1 = 2h+1
   6. QED
2. Prove that for all integers m and n, if m is odd and n is even then mn is even
   1. Assuming m is an odd integer and n is an even integer, we shall prove mn is even
   2. Since m is odd, m = 2k + 1
   3. Since n is even, n = 2j
   4. Mn = (2k + 1) \* (2j) = 4kj + 2j = 2(2kj + j)
   5. 2(2kj + j) = 2h
   6. QED
3. Prove that for all rational numbers x and y, xy is rational
   1. Assuming x and y are rational, we shall prove xy is rational
   2. X = m/n, n != 0
   3. Y = j/k, k != 0
   4. Xy = (m/n) \* (j/k) = mj/nk
   5. Mj/nk = q/r
   6. QED
4. Prove that for every rational number x, if x!=0, then 1/x is rational
   1. Assuming x is rational and x !=0, we shall prove that 1/x is rational
   2. X = m/n, n !=0
   3. 1/x = 1/ (m/n) = n/m
   4. Since x !=0, m/n != 0,
   5. Thus, m != 0
   6. Since n/m and m != 0
   7. QED
5. Prove that the product of two integers, mn, where m = 3i + 2, n = 3j + 2 and I and j are integers, is r = 3k + 1 for some integer k
   1. Assuming m = 3i + 2 and n = 3j + 2, we shall prove that mn = r = 3k + 1
   2. Mn = (3i + 2) \* (3j + 2) = 9ij + 6i + 6j + 4 = 3(3ij + 2i + 2j + 1) + 1
   3. 3(3ij +2i + 2j + 1) + 1 = 3k + 1
   4. QED
6. Use a proof by contradiction that for all real numbers, x, if x^2 is irrational then x is irrational
   1. Assuming x^2 is irrational and x is rational, we shall prove a contradiction
   2. X = p/q, q != 0
   3. X^2 = p^2/q^2
   4. P^2/q^2 = m/n, n !=0
   5. X^2 != m/n, n !=0
   6. QED