CS 225 Quiz over Week 2 Materials
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1)

X is an integer.

x, x + 1, and x + 2 are three consecutive integers

N = 3k.

x + (x + 1) + (x + 2) = 3k

Let k = x + 1.

x + (x + 1) + (x + 2) = 3x + 3 = 3(x + 1)

Since x is an integer, x + 1 would also be an integer.

Hence x + (x + 1) + (x + 2) = 3k.

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2)

r = n/m for some integers n, m.

$5r^2 - 2r + 3$

= $5(n/m)^2$ - 2(n/m) + 3

= $5n^2 / m^2$ - 2n/m + 3

= $(5n^2 - 2nm + 3m^2) / m^2$

Suppose that p = $(5n^2 - 2nm + 3m^2)$ and q =m^2

p and q are integers because n and m are integers. **So p/q proves that $5r^2 - 2r + 3$ is a rational**.

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3)

Let P be the proposition that x^2 (y+3) is EVEN

and let Q be the proposition that x is EVEN or y is odd

Contraposition:

IF x is odd or y is even, then x^2 (y+3) is odd

x = 2k + 1

y = 2j

Substitute for x and y in the equation...

$(2k + 1)^2 (2j + 3)$

=(2k + 1)(2k + 1) * (2j + 3)

= $(4k^2 + 2k + 2k + 1)$ * (2j + 3)

= $(4k^2 + 4k + 1)$ * (2j + 3)

= $8kj^2 + 12k^2 + 8kj + 12k + 2j + 3$

2(4kj2 + 6k2 + 4kj + 6k + 1j + 1) + 1 = 2(some integer) + 1 which is an odd integer.

This proves that 2k + 1 = x^2 (y+3) is an odd integer.

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4)

P statement: If m2 + n2 is odd,

Q statement: then m is odd or n is odd.

Contraposition:

If m is even AND n is even, then $m^2 + n^2$ is even

m = 2a

n = 2b

= $2a^2 + 2b^2$

= $2(a^2 + b^2)$ = 2 * (some integer) is an even integer

so $2(a^2$ + b2) = $m^2 + n^2$ which is even. So if m and n are both even, then when $m^2 + n^2$ is odd, then m is odd OR n is odd.

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5)

P: If a and b are rational numbers

b != 0 && x is irrational

Q: then a + bx is irrational.

First I say that "a + bx" is rational. Then "bx = (a + bx) - a" is rational because it's the difference of two rational numbers.

"x = bx/b" which is rational, because it is the quotient of two rational numbers. Remember that b is not equal to 0, so bx/b is rational as a result because the denominator is not 0.

The problem is that x is irrational, but we've assumed that x is rational - therefore we have a contradiction which means that "a + bx" is **irrational**.
