#1-10:

Prove:

$$\sum_{i=1}^{n} i = n(n+1)/2 \text{ for } n >= 0, \text{ by induction}$$

Figure 1: formula

$$\sum_{i=1}^{n} i = n(n+1)/2 \text{ for } n >= 0, \text{ by induction}$$

Figure 2: formula

$$\sum_{i=1}^{n} i = n(n+1)/2 \text{ for } n >= 0, \text{ by induction}$$

Figure 3: formula

$$\sum_{i=1}^n i = n(n+1)/2 \ for \ n>=0, \ by \ induction$$

$$\sum_{i=1}^{n} i = n(n+1)/2 \text{ for } n >= 0, \text{ by induction}$$

$$\sum_{i=1}^{n} i = n(n+1)/2 forn >= 0, by induction zz$$

Let n = 1. Then:

establishing our base case.

Assume that:

We must show:

QED

#1-10:

Prove:

Let n = 1. Then:

$$n(n+1)/2 = 1 = \sum_{i=1}^{1} i$$

Figure 4: formula

$$\sum_{i=1}^{n} i = n(n+1)/2 \quad for \ n <= k,$$

Figure 5: formula

$$\sum_{i=1}^{n+1} i = (n+1)(n+2)/2$$

Figure 6: formula

$$\sum_{i=1}^{n+1} i = (n+1) + \sum_{i=1}^{n} i$$

Figure 7: formula

$$\sum_{i=1}^{n+1} i = (n+1) + \sum_{i=1}^{n} i$$

$$= (n+1) + n(n+1)/2$$

$$= [2(n+1) + n(n+1)]/2$$

$$= (n+1)(n+2)/s$$

Figure 8: formula

$$\sum_{i=1}^{n} i = n(n+1)/2 \text{ for } n \ge 0, \text{ by induction}$$

Figure 9: formula

$$n(n+1)/2 = 1 = \sum_{i=1}^{1} i$$

Figure 10: formula

establishing our base case.

Assume that:

$$\sum_{i=1}^{n} i = n(n+1)/2 \quad for \ n <= k,$$

Figure 11: formula

We must show:

QED

#1-11:

let n = 1. Then $n(n+1)(2n+1)/6 = 1 = SUM\{i=1,1\}(i^2)$ Assume that $SUM\{i=1,n\}(i^2) = n(n+1)(2n+1)/6$. $SUM\{i=1,n+1\}(i^2) = (n+1)^2 + SUM\{i=1,n\}(i^2)$ $= (n+1)^2 + n(n+1)(2n+1)/6$ = (n+1)[6(n+1) + n(2n+1)]/6

Prove: $SUM\{i=1,n\}(i^2) = n(n+1)(2n+1)/6$ for $n \ge 0$, by induction

 $= (n+1)[2n^2 +7n + 6] / 6$ = (n+1)(n+2)(2n +3) / 6 = (n+1)(n+2)(2(n+1) + 1) / 6 which we needed to how :.

1-12: // SUM{i=1,n}(i^3) = $n^{2(n+1)}2/4$ for n >= 0, by induction

1-13: // Prove SUM{i=1,n}((i)(*i*+1)(i+2)) = n(n+1)(n+2)(n+3)/4 for n >= 0, by induction

$$\sum_{i=1}^{n+1} i = (n+1)(n+2)/2$$

Figure 12: formula

$$\sum_{i=1}^{n+1} i = (n+1) + \sum_{i=1}^{n} i$$

Figure 13: formula

$$\sum_{i=1}^{n+1} i = (n+1) + \sum_{i=1}^{n} i$$

$$= (n+1) + n(n+1)/2$$

$$= [2(n+1) + n(n+1)]/2$$

$$= (n+1)(n+2)/s$$

Figure 14: formula

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1-14: // Prove by induction on n >= 1 that for every a!=1 SUM{i=0,n}(a^i) = [a^(n+1) - 1] / [a - 1]
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1-15: // Prove by induction on $n \ge 1$ SUM $\{i=1,n\}(1/i*(i+1)) = n/(n+1)$

1-16: // Prove by induction that $n^3 + 2n$ is divisible by 3 for all n >= 0.

1-17: // Prove by induction that a tree with n vertices has exactly n - 1 edges

1-18: // Prove by mathematical induction that the sum of the cubes of the first n positive integers is equal to the square of the sum of these integers, i.e. $SUM\{i=1,n\}(i^3) = [SUM\{i=1,n\}(i)]^2$

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![formula](http://latex.codecogs.com/gif.latex?%24%24%5Cint_%7Ba%7D%5E%7Bb%7D%20x%5E2%20dx%



Figure 15: formula