Math 321

Q's / 5.2 #7 $2, $5 $5, $7

Amount: $2, $4, $5, $6, $7, $8, $9,

" " " " "

1·$2 2·$2 1·$5 3·$2 1·$5 + 1·$2

+$2 +$2 +$2 +$2

Conjecture $\boxed{n = 4, 5, 6, \ldots \quad n = \text{combo of } \$2, \$5}$

pf basis

$4 = 2·$2 $5 = $5 true

Inductive "strong"

(I.H.) assume $4, $5, ..., $K can be formed by $2, $5
show $K+1 can be formed by $2, $5

$$\$K+1 = \underbrace{\$(K-1)}_{\text{I.H. combo of } \$2, \$5} + 1\cdot\$2 = \text{combo of } \$2, \$5$$

true

Fund. thm of Arithmetic n ≥ 2, is prime or a uniq prod of primes in non-dec order

two tasks ① existence n = prod of primes or is prime

② Uniq only one version of product of primes

Existence (strong induction)

(basis) (1st case) $n=2$ is prime **true**

(inductive)

assume $n=2 \wedge n=3 \wedge \ldots \wedge n=k$ are all either prime or prod. of primes

show: $n=k+1$ is prime or prod of primes

case 1 $n=k+1$ is prime **true**

case 2 $n=k+1$ is not prime (composite)

Note: q is prime $1, 2, 3, \ldots, q-1, q$

only factors are $q = 1 \cdot q$

q is not prime

$q = a \cdot b \to 2 \le a \le q-1$, $2 \le b \le q-1$

so $k+1 = a \cdot b$ $2 \le a \le k$ $2 \le b \le k$

by I.H. a, b are prime or prod of primes

$k+1 = $ (prime or prod of primes) (prime or prod of prime) $=$ prod of prime

true

$2, 3, 4, 5, 6, 7, \ldots, 36, \boxed{37}, \ldots$

$4 = 2 \cdot 2$, $6 = 2 \cdot 3$, $36 = 6 \cdot 6 = (2 \cdot 3)(2 \cdot 3)$

5.3 Use induction to make sequence (functions) or sets

ex (Basis) $f_0 = 0$, $f_1 = 1$

(Inductive) $\boxed{f_n = f_{n-1} + f_{n-2} \quad n = 2, 3, 4, \ldots}$

$0, 1, 1, 2, 3, 5, 8, \ldots$
$i=0 \quad i=1 \quad i=2 \quad i=3 \quad i=4$

inductive formula
recursive formula
definition rule

ex function $n = fib(i)$ f_i

(Basis) $i = 0 \to n = 0$
$i = 1 \to n = 1$

(inductive)

$n = fib(i-1) + fib(i-2);$

end

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ex (Basis) $\underline{f(0) = 1}$ $\underline{f(1) = 2}$ $\underline{f(2) = -1}$

(Recursive) $f(n) = 2f(n-2) + 3f(n-3)$
$n = 3, 4, 5, \ldots$

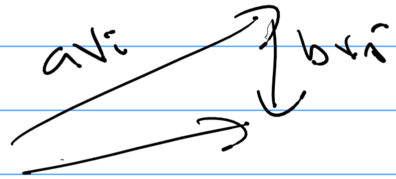
degree 3 formula
(needs values 3 into the past)

$1, 2, -1, 7, 4, 11, \ldots$

Linear Algebra : Vector Space

(Basis) $\boxed{v_1 = \nearrow \qquad v_2 = \downarrow}$

(inductive) v_i, v_j are in my space



$v_n = a v_i + b v_j$ is in the space