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HOMEWORK
DISCRETE MATHEMATICS
PROBLEM SET 06

Problem 1:

$P(x) = (1).\Delta_1(x) + (2).\Delta_2(x) + (3).\Delta_3(x)$

$= 1*\frac{(x-4)(x-5)}{(3-4)(3-5)} + 2*\frac{(x-3)(x-5)}{(4-3)(4-5)} + 3*\frac{(x-3)(x-4)}{(5-3)(5-4)}$

$= \frac{x^2-9x+20}{2} - 2*\frac{x^2-8x+15}{1} + 3*\frac{x^2-7x+12}{2}$

$= x - 2$

Problem 2:

$P(x) = (4).\Delta 1(x) + (3).\Delta_2(x) + (5).\Delta_3(x)$

$= 4*\frac{(x-1)(x-3)}{(2-1)(2-3)} + 3*\frac{(x-2)(x-3)}{(1-2)(1-3)} + 5*\frac{(x-2)(x-1)}{(3-2)(3-1)}$

$= \frac{-4(x^2-4x+3)}{1} + \frac{3(x^2-5x+6)}{2} + \frac{5(x^2-3x+2)}{2}$

$= x + 2$

Problem 3:

$P(x) = (-2).\Delta_1(x) + (7).\Delta_2(x) + (20).\Delta_3(x)$

$= -2*\frac{(x-2)(x-3)}{(1-2)(1-3)} + 7*\frac{(x-1)(x-3)}{(2-1)(2-3)} + 20*\frac{(x-1)(x-2)}{(3-1)(3-2)}$

$= -x^2 + 5x - 6 - 7(x^2 - 4x + 3) + 10(x^2 - 3x + 2)$

$= 2x^2 + 3x - 7$

Problem 4:

a) If official 3, 4 and 5 get together, they know P(3)=1, P(4)=6, P(5) = 3

=> P(x) goes through (3,1), (4,6) and (5,3) => $P1(x) = -4x^2 + 33x - 62$

=> P(0) = 0 + 0 -62 = -62 => the secret S1 is -62

b) If official 1, 2 and 5 get together, they know P(1)=2, P(2)=2, P(5) = 3

=> P(x) goes through (1,2), (2,2) and (5,3) => $P2(x) = \frac{1}{12}x^2 - \frac{1}{4}x + \frac{13}{6}$

=>$P(0) = \frac{13}{6}$ => the secret S2 is $\frac{13}{6}$