Math 120 Quiz #2 Sept. 26, 2010

Problem 1

Solve the following inequality:

 $|x-3| \le 2$

Solution

Do not forget that solving these absolute value inequalities requires breaking the equation into two simpler equations. You CANNOT simply add 3.

$$\begin{array}{ccc} x-3 \leq 2 & & x-3 \geq -2 \\ x \leq 5 & & x \geq 1 \end{array}$$

These two inequalities combined give the solution

$$x \in [1, 5]$$

Problem 2

Evaulate the following summation:

$$\sum_{k=1}^{n} 2k - 3$$

Solution

You need to break apart the summation and use the basic summation formulas

$$\sum_{k=1}^{n} 2k - 3 = \sum_{k=1}^{n} 2k - \sum_{k=1}^{n} 3$$
$$= 2\sum_{k=1}^{n} k - 3\sum_{k=1}^{n} 1$$
$$= 2\frac{n(n+1)}{2} - 3n$$
$$= n^2 - 2n$$

Problem 3

Suppose that there is a planet where the total population in a year is dependent on the amount of food f.

- The population at the beginning of the year is 100,
- the population born is f, and
- the population dying is 2(25 f).

The population at the end of the year is equal to the initial population plus the change in population (births minus deaths).

How much food is needed to finish the year with a population of 350? (The answer should read f = ??)

Solution

We need to use the equation described in the problem:

$$P_{end} = P_{init} + B - D$$

where P_{end} is the initial population, P_{init} is the initial population, B is the number of births and D is the number of deaths. Substituting in everything we know from the problem, this equation gives:

$$350 = 100 + f - 2(25 - f)$$

$$350 = 100 + f - 50 + 2f$$

$$300 = 3f$$

$$100 = f$$