Math 8: Homework Questions 1

Submit questions 1, 3, 5, 6(c), 7 & 8. Remember that the goal isn't to find the solutions, but to *explain* your answers as clearly as possible—credit will be given for presentation!

1. The cost of gasoline is \$4.20 per gallon on January 1st and \$4.90 on March 1st. State a *linear* function for the cost of gasoline as a function of time.
(*There are multiple correct answers, depending on your decision how to measure time*!)

2. Let d represent the cost in millions of dollars to produce n cars, where n is measured in 1000's. As clearly as you can, explain what the following mean in words:

   (a) $d(25) = 431$. (b) $d(n) = bn + c$

3. You have a choice of three different cell-phone plans.

   (a) No monthly charge and 10¢ per minute for all calls.
   (b) \$10 per month and 5¢ per minute for all calls.
   (c) \$30 per month, regardless of how many calls you make.

   How should you determine which of the plans to purchase?

4. Temperature readings T (in °F) were recorded every two hours from midnight to noon. Time t was measured in hours from midnight.

t	0	2	4	6	8	10	12
T	82	75	74	75	84	90	93

   (a) Use the readings to sketch a rough graph of T as a function of t.
   (b) Use your graph to estimate the temperature at 10:30 am.

5. A balloon with radius r inches has volume $V(r) = \frac{4}{3}\pi r^3$. Find a function that represents the volume of air required to inflate the balloon from a radius of r inches to a radius of $r+1$ inches.

6. Find the implied domain $U \subseteq \mathbb{R}$ of each of the following functions $f : U \to \mathbb{R}$:

   (a) $f(x) = \dfrac{x+4}{x^2-9}$ (b) $f(x) = \dfrac{2x^3-5}{x^2+x-6}$ (c) $f(x) = \dfrac{x+1}{1+\frac{1}{x+1}}$

7. (a) Let $A = \{1,3,5,7,9\}$. Explain in words what is meant by the set $B = \{x \in A : x^2 > 10\}$, and state B in roster notation.
   (b) Find the set $C = \{x \in \mathbb{N} : (x-1)^2 < 16\}$ in roster notation.
   (c) Find the Cartesian product $B \times C$ in roster notation. Is it the same as $C \times B$?

8. Determine the range of the following function $f : \mathbb{R} \to \mathbb{R}$. Decide whether f is 1–1 and/or onto, and sketch its graph.

$$f(x) = \begin{cases} 3 - \frac{1}{2}x & \text{if } x \leq 2, \\ 2 - \frac{1}{x} & \text{if } x > 2. \end{cases}$$

9. A box (without lid) is to be made by cutting squares of side-length x in from the corners of a piece of card which is 12 in by 20 in and folding up the edges. Find the volume V of the box as a function of x.