Problem 1
Consider the following piecewise defined function
\[
f(x) = \begin{cases} 
2x - 4, & -4 < x \leq 1 \\
x - 3, & 1 < x \leq 3 \\
1 - x, & 3 < x < 6 
\end{cases}
\]

(a) (3 pts) Sketch the graph of this function

(b) (3 pts) Find the domain and range of this function

Date: September 28, 2010.
Problem 2 (14 points)

In order to gain popularity among students, a brand new on-campus hair salon plans to offer a special promotion. The cost of a haircut, in dollars, at the salon as a function of time, in days since February 10th may be described as

\[
C(t) = \begin{cases} 
9, & 0 \leq t \leq 3 \\
9 + t, & 3 < t \leq 8 \\
20, & 8 < t < 28
\end{cases}
\]

(Assume \( t \) takes whole numbers values.)

(a) (3 pts.) If you want them to give them a try, on what date(s) should you have a haircut in order to get the best price?

(b) (2 pts.) How much will a haircut cost on Feb. 18th?

(c) (2 pts.) On what date will a haircut cost 13 dollars?

(d) (3 pts.) The cost of a haircut at least \( A \) dollars \( B \) days into the promotion. Write an expression that describes this sentence using function notation and mathematics symbols only.

(e) (4 pts) Calculate \( C(9) - C(8) \) and interpret its meaning in the context of the problem.
Problem 3
(3 pts). Sketch a graph which is everywhere positive, increasing, and concave up.

Problem 4.
(4 pts.) Let \( P = f(t) \) be the population in millions in year \( t \). Assume this function is invertible. Give the meaning and units of the inverse function.

Problem 5.
(4 Pts). Find the zeros of \( Q(x) = -5x + 2x^2 - 3 \) using the quadratic formula.
Problem 6

(4 Pts). Determine the concavity of the graph of \( f(x) = 4 - x^2 \) between \( x = -1 \) and \( x = 5 \) by calculating average rates of change over intervals of length 2.