Principles of Programming Languages - Homework I

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1 Instructions

1. The homework assignment is to turned in by $11:00$ am. in class on February 1.
2. Each question is worth 3 points.
3. Attempt as many problems as you can. You will be given partial credit, as per the policy discussed in class.

2 Problems

1. Write a function in SCHEME for computing the number of digits of a positive integer. You may assume the existence of the *successor()* function, which returns $(x+1)$, when called with x.
2. Write a fragment in PROLOG that returns 2^x, when called with x.
3. As discussed in class, the **C** language permits only call-by-value as a parameter- passing mechanism. How then can the value of a variable be changed permanently within a function?
4. Discuss how the following features have been promoted and violated in the **C** programming language: (a) Expressiveness, (b) Uniformity.
5. Assume that you are given a rudimentary programming language which contains only four operators, viz., $+$, $-$, abs and div. $+$ and $-$ have their usual meanings, while $div(a,b)$ returns the quotient of $\frac{a}{b}$ and $abs(a)$ returns the absolute value of a. Write a **C**-style function $\max(a,b)$ that takes two integers a and b as input and returns the maximum of the two. Note that you can only use the operators provided; in particular, the constructs "**if**", "**while**", and "**for**" are not available.