# Problem Set No. 3

**Dept. of Computer Science**

**Date:** March 17, 2001
**Due:** TBA

**1.** Do Ch. 7 problems 5 and 9.

**2.** Without using Rice's theorem, show that the set $A = \{x : 3 \in \mathrm{ran}(\phi_x)\}$ is not recursive. (I.e., "$x \in A$ is unsolvable").

**3.** Is the "proof" below correct? If not, where exactly does it go wrong?
"Let $y = f(\vec{x}_n)$ be r.e. Then $y = f(\vec{x}_n) \equiv \psi(y, \vec{x}_n) = 0$ for some $\psi \in \mathcal{P}$. Thus $g = \lambda \vec{x}_n.(\mu y)\psi(y, \vec{x}_n)$ is in $\mathcal{P}$. But $g = f$, since the unbounded search finds the $y$ that makes $y = f(\vec{x}_n)$ true, if $f(\vec{x}_n) \downarrow$. Thus, $f \in \mathcal{P}$."

**4.** Chapter 8, problem 7.

**5.** Chapter 13, problems 1, 7, 23, 26, 48.