Midterm 2

3) Determine whether the function $f(x) = x + sin(x)$ has an inverse. If so, give the domain and range.

(5 points) $f(x) = x + sin(x)$, so $f`(x) = 1 + cos(x)$.

(15 points) $f`(x) \geq 0$ and $f`(x) = 0$ for $x = \pi + 2k\pi$ (for integer k) which is a discrete set and hence f is increasing. Thus, f has an inverse.

(10 points) The domain and range of f^{-1} are the range and domain (resp) of f. The domain of f is all reals, hence so is the range of f^{-1}. Also, note that since $\lim_{x\to-\infty} f(x) = -\infty$, $\lim_{x\to\infty} f(x) = \infty$, and f is continuous, the range of f is all reals, hence so is the domain of f^{-1}.