Show all work. You may leave arithmetic expressions in any form that a calculator could evaluate. By putting your name on this paper, you agree to abide by the university's code of academic integrity in completing the quiz. Use no books, calculators, cellphones, other electronic devices, communication with others, scratchpaper, etc.

Name _____

1. (20) Fill in the following table, giving features of various algorithms for minimizing $f(x)$. The first line has been done for you, as an example.

Method	convergence rate	Storage	f evals/itn	g evals/itn	H evals/itn
Truncated Newton	> 1	$O(n)$	1	$\leq n + 1$	0
Newton					
Quasi-Newton					
steepest descent					
Conjugate gradients					

- Assume that all of these methods are convergent and that any line search is exact (i.e., the true optimal value of the steplength parameter is used).

- Don't include the cost of the line search in your table entries. We are omitting this cost because it is the same, independent of method.

- f is the function, g is the gradient, and H is the Hessian matrix. "evals/itn" means the number of evaluations per iteration.

- The convergence rate should be "1" for linear, "> 1" for superlinear, or "2" for quadratic.

- Storage should be either $O(1)$, $O(n)$, or $O(n^2)$, where n is the number of variables (i.e., the dimension of x).

- "Conjugate gradients" means the nonlinear cg method, not the one for solving linear systems (minimizing quadratics).