1. (10) Fill in the 5 empty boxes with (exactly) one appropriate algorithm.

```
Is f quadratic? Yes

No

Are first and second derivatives available, with enough room to store them? Yes

No

Are first derivatives explicitly available, or available using automatic differentiation?

Yes

Is there enough room to store a matrix?

No

Is f differentiable?

Yes

No
```

Use Cholesky factorization or conjugate gradients.
2. You want to solve the problem

$$\min_{\mathbf{x}} (x_1 - 2)^2 - (x_2 - 5)^2.$$ 

Your assistant tells you that the solution is $x_1 = 2, x_2 = 5$.

2a. (5) Check the first- and second-order optimality conditions at $x_1 = 2, x_2 = 5$.

2b. (5) Is the point a local minimizer? Explain why or why not.