1. Free/minimum time trajectory optimization problems are usually nonconvex, except for when the dynamics are linear.
   (a) true
   (b) false
2. Direct trajectory optimization with a NonLinear Programming (NLP) solver like SNOPT/IPOPT can just as easily use explicit or implicit integration schemes.
   (a) true
   (b) false
3. Trajectory optimization with DDP/iLQR can just as easily use explicit or implicit integration schemes.
   (a) true
   (b) false
4. Both DDP/iLQR methods and direct trajectory optimization allow for warm starting of the controls (initializing the solver with a "guess" control trajectory).
   (a) true
   (b) false
5. Both DDP/iLQR methods and direct trajectory optimization allow for warm starting of the states (initializing the solver with a "guess" state trajectory).
   (a) true
   (b) false
6. NonLinear Program (NLP) solvers like SNOPT and IPOPT are guaranteed to find a **feasible** solution to a nonconvex problem if it exists.
   (a) true
   (b) false
7. NonLinear Program (NLP) solvers like SNOPT and IPOPT are guaranteed to find a **locally optimal** solution to a nonconvex problem if it exists.
   (a) true
   (b) false
8. NonLinear Program (NLP) solvers like SNOPT and IPOPT are guaranteed to find a **globally optimal** solution to a nonconvex problem if it exists.
   (a) true
   (b) false
9. How many degrees of freedom exist in the group of 3D rotations?
   (a) 3
   (b) 4
   (c) 9
10. There exists a singularity-free three-parameter attitude representation.
   (a) true
   (b) false

11. Simulating the kinematics of a quaternion does not require any trigonometric functions.

(a) true

(b) false

12. Every unique attitude can be described by how many unique quaternions?

(a) 1

(b) 2

(c) 4

13. These two quaternions describe the same attitude but different rotations. Which rotation is "shorter"?

$$q_1 = \begin{bmatrix} \frac{\sqrt{2}}{2} \\ 0 \\ 0 \\ \frac{\sqrt{2}}{2} \end{bmatrix} \qquad q_2 = \begin{bmatrix} -\frac{\sqrt{2}}{2} \\ 0 \\ 0 \\ -\frac{\sqrt{2}}{2} \end{bmatrix} \tag{1}$$

(a) 1

(b) 2