

Name:

- 1) True or False: there are always equilibrium solutions to the Newtonian n -body problem.
- 2) What is the minimal number of bodies for which one can prove that an escape to infinity in finite time is possible?
 - a) 2
 - b) 3
 - c) 4
 - d) 5
- 3) Which of the following problems are considered "restricted three body problems":
 - a) The Earth-Moon-Sun system.
 - b) The Sitnikov problem.
 - c) A planet moving in the influence of a uniformly rotating binary star system.
 - d) The Kepler problem.
- 4) Who was the first to find non-collision singularities of the Newtonian n -body problem?
 - a) Joseph Gerwer
 - b) Jeff Xia
 - c) Jürgen Moser
 - d) Henri Poincare
- 5) If for all t , we have a skew-symmetric matrix $B(t)$ and $S(t)$ satisfies the matrix differential equation $\dot{S} = BS$ with the initial condition $S(0) = I$, then S is
 - a) orthogonal
 - b) skew symmetric
 - c) symmetric
 - d) the identity matrix
- 6) Which of the following are ingredients of the proof of chaotic orbits in the Sitnikov problem
 - a) A horse shoe construction.
 - b) Stable and instable manifolds
 - c) The Jacobi integral.
 - d) The Poincare return map.
 - e) The Poincare recurrence theorem.
 - f) Continued fraction expansion.
- 7) Which of the following statements is called the third Kepler law:
 - a) The radius vector covers equal area in equal time.
 - b) Each of the bodies moves on an ellipse.
 - c) T^2/a^3 is constant.
- 8) The solar system is a dynamical system which shows very weak type of chaos. If one knows the position of the earth with accuracy $1km$, how long does one have to wait until the uncertainty of the orbit has grown to about 1 astronomical unit (the mean distance of the earth to the sun)?
 - a) 10'000 years
 - b) 1 Million years
 - c) 100 Million years
 - d) 10 Billion years
- 9) Which periodic three body solution has been observed in our solar system?
 - a) Euler motion.
 - b) Lagrange motion.
 - c) Hills solutions.
 - d) Moore choreographies.
- 10) How many integrals can one find for a general n -body problem:
 - a) 1
 - b) 10
 - c) $3n$
 - d) $6n$
- 11) How many integrals (conserved quantities) did you find for the n -body Toda system?
 - a) 2
 - b) n
 - c) $2n$
- 12) Which of the following forces occur in a rotating coordinate system and depend on the angular speed of the rotation?
 - a) Centrifugal force
 - b) Coriolis force